SECTOR		
A	ARMARIO	
B	ESTANTERIA	
C	FICHERO	
D	ESTANTE	
E	CARPETA	
F	BIBLIORATO	
G	CAJA/ON	
H		
I	ALFABETICO	
J	EJEMPLAR	
OBSERV.	C43/1	

Report of the

Grasslands Trials Unit

1975 - 79

FALKLAND ISLANDS

GRASSLANDS TRIALS UNIT : FALKLAND ISLANDS : 1975-79

REPORT

68PP

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GRASSLANDS TRIALS UNIT : FALKLAND ISLANDS : 1975-79

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GRASSLANDS TRIALS UNIT : FALKLAND ISLANDS : 1975-79

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" " " " " " TREATMENT 71,72,74 AGE
" " " " " C V. T. 75 AGE
78/79 " " " " 1.3 EWE V. WETHER HOGGS
" " " " " 1.3 " " SHEARLINGS
" " " " " 1.3 ADULT DRY EWES (5 AGES)
" " " " " 1.3 ADULT WETHERS (4 AGES)

HISTOGRAM 1	78/79	4 CROP LACTATING	1.1 CONTROL	SHORN JAN
2	"	"	"	" MAR
3	"	3 CROP "	"	" JAN
4	"	" "	"	" MAR
5	"	2 CROP "	"	" JAN
6	"	" "	"	" MAR
7	"	1 CROP "	"	" JAN
8	"	" "	"	" MAR
9	78/79	4 CROP LACTATING	1.1 TREATMENT	SHORN JAN
10	"	3 " "	"	" JAN
11	"	1 " "	"	" JAN
12	78/79	0 CROP LACTATING	1.1 CONTROL	SHORN (DEC)
13	"	0 CROP "	1.1 TREATMENT	" (DEC)
14	78/79	EWE HOGGS 1.3		
15	"	WETHER HOGGS 1.3		
16	"	SHEARLING EWES 1.3		
17	"	SHEARLING WETHERS 1.3		
18	78/79	71 AGE (6SE) DRY EWES	1.3	SHORN FEB
19	"	72 AGE (5SE) " "	1.3	" FEB
20	"	73 AGE (4SE) " "	1.3	" FEB
21	"	74 AGE (3SE) " "	1.3	" REB
22	"	75 AGE (2SE) " "	1.3	" FEB
23	"	72 AGE (5SW) WETHERS	1.3	SHORN DEC
24	"	73 AGE (4SW) "	1.3	" DEC
25	"	74 AGE (3SW) "	1.3	" DEC
26	"	75 AGE (2SW) "	1.3	" DEC

MEAN MONTHLY DAY LENGTH (HRS) PORT STANLEY LAT 51°42'S
MEAN GREASY FLEECE WTS EWES 1.3, 1.4 DRY EWES V. 1.1 C & T LACTATING 1978/79

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GRASSLANDS TRIALS UNIT : FALKLAND ISLANDS : 1975-79

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VAN SOEST ADF
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GRASSLANDS TRIALS UNIT : FALKLAND ISLANDS : 1975-79

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POA GREENS
BOGGED WHITEGRASS
DIDDLE-DEE (Empetrum rubrum)
WHITEGRASS
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POND GREENS
POA GREENS
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12. INTER DROPPING PERIODS OF UPLAND GEESE GRAZING ON GREENS IN SUMMER

VEGETATION MAP OF CARCASS ISLAND 1:25000 (TWO PARTS)

The Grasslands Trials Unit was recommended by Davies et al (71) due to the absence of basic information concerning sheep farming in the Falklands -

> "An Agricultural Experiment Unit should be set up as soon as possible.
>
> ... Her Majesty's Government in the United Kingdom should be approached for assistance in financing the proposed Agricultural Experimental Unit.
>
> ... The proposed Agricultural Experimental Unit should be attached to, or even part of, a larger similar institution."

GTU (Technical Cooperation, ODA) commenced in 1975 with the arrival of C. D. Kerr, the Consultant Supervisor being T. H. Davies the leader of the previous Team. An Experimental Farm was not established, all the work being done at private sites. This has involved a great deal of cooperation from Farm Staff, the Air Service and Coastal Shipping for which all GTU Members are grateful.

Equipment and Staff salaries are provided by HM Government; all other costs and the remuneration of Assistants and Field Staff are provided by FI Government. To date GTU has never been denied any request from either Government.

Members of Staff wish to thank all those who have helped so willingly with the work; here, in UK, and in other parts of the world.

C. D. KERR
GTU TEAM LEADER
September 1979

REPORT SUMMARY

1. SYSTEMS

Detailed experiments and extensive trials using improved management techniques show that ewes still require, in the majority of circumstances, better nutrition to substantially raise production.

It is apparent that more wool per unit area will be obtained by using wethers in rotational rather than set stocked systems.

Detailed costing methods for all aspects of production have been devised.

2. AGRONOMY

The provision of appropriate reseeds is being studied as is the effect of greater utilization of native pastures, especially whitegrass.

3. ANIMAL PRODUCTION

An understanding of the various aspects of production is emerging.

The major constraint, other than nutrition, on increased production is the absence of a breeding programme based on performance selection. A scheme suitable for the Falklands has been devised, distributed and is included.

4. ANIMAL HEALTH

The number of identified infectious diseases is very low and therefore the overall health of the livestock is good.

Strenuous efforts are made to reduce the incidence of existing diseases and to prevent the introduction of new infectious diseases.

5. LABORATORY STUDIES

The small laboratory is multi-disciplined and carries out analyses of samples mainly in veterinary investigation and agronomy. Samples for analysis outwith its capabilities are sent to UK.

6. GOOSE STUDY

An understanding of the biology, organisation, distribution and intake of the geese now permits the study of competitive factors.

REPORT

GRASSLANDS TRIALS UNIT 1975-79

STAFF		ARRIVE	LEAVE	DEPART
C. D. KERR	SHEEP MANAGEMENT SPECIALIST AND TEAM LEADER	Jul 75	77, 78	Dec 79
J. H. McADAM	PASTURE AGRONOMIST	Jan 76		May 78
R. S. WHITLEY	VETERINARY SURGEON	Jun 76	78, 79	Sep 80
MISS H. ROGERS	BIOCHEMIST	Mar 77	78	Feb 79
R. W. SUMMERS	GOOSE OFFICER	Sep 77	79	Mar 81
T. P. MAITLAND	FIELD OFFICER	Oct 77		Apr 80
MISS M. R. BURKETT	PASTURE AGRONOMIST	Apr 79		May 82
A. S. GRIEVE	MICROBIOLOGIST/BIOCHEMIST	May 79		May 81
J. HARRADINE	GOOSE OFFICER	Mar 74		May 76

J. RILEY — STATISTICAL ADVISER ROTHAMSTEAD

M. J. VAGG — BIOCHEMIST (SECTION 4.2) ARC COMPTON

F.I. SUPPORT STAFF

SECRETARY	76-79	MRS. M. V. KERR
	79-	MISS E. E. BARTON
CLERK	78-79	MISS S. M. STRANGE
FIELD ASSISTANTS	79-	D. LIVERMORE
	79-	K. S. KILMARTIN
	78-79	D. OVERTON (PART-TIME)
	76	S. HEATHMAN (LAMBING 1.1)
	76-	MISS T. PORTER (PPFE 3.2 SEASONAL)

ADVISERS

CONSULTANT SUPERVISORS: AGRONOMY

76- T. H. DAVIES ADAS
SYSTEMS AND ANIMAL STUDIES

78- J. EADIE HFRO
GOOSE STUDY

76- PROF. G. M. DUNNET ABD. UNIV.

ADVISERS: AGRICULTURE

75-77 J. B. WARREN ODA

77- R. L. WADDELL ODA

ANIMAL HEALTH

74- A. L. C. THORNE ODA

DESK OFFICERS:

75-76 MISS M. E. HUNT FCO

76- MISS M TANDY FCO

76-78 MRS. C. JOHNSON ODA

78- J. MOLLOY ODA

NAME	ADDRESS	AMOUNT	DATE
C. M. Cole	412 W. Main St.	$1,200	Jan 3
J. T. Hayes	1508 Oak Ave.	$ 850	Jan 3
Mrs. Ethel Dunn	27 Elm Court	$ 500	Jan 5
Wm. F. Cook	903 Pine St.	$ 750	Jan 5
R. H. Bradley	66 Old Mill Rd.	$ 300	Jan 7
Miss E. Rogers	Rogers Dept. Store	$ 175	Jan 7
C. D. Hall	1204 Lee St.	$ 600	Jan 8
T. J. Wilson	315 Cedar Ln.	$ 400	Jan 8
Mrs. L. Martin	88 Park Pl.	$ 250	Jan 9
W. T. Reed	1601 Main St.	$ 350	Jan 9
Dr. H. Stone	520 Medical Bldg.	$ 500	Jan 10
Mrs. A. Foster	77 Hill Rd.	$ 200	Jan 10
J. P. Morgan	1 Wall St.	$ 1,000	Jan 11
Mrs. C. Bell	412 W. Main St.	$ 300	Jan 11
F. W. Davis	1508 Oak Ave.	$ 450	Jan 12
Mrs. A. Clark	27 Elm Court	$ 200	Jan 12
S. L. Owens	903 Pine St.	$ 600	Jan 13
H. B. Smith	66 Old Mill Rd.	$ 150	Jan 13
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Jan 14
W. J. Price	1601 Main St.	$ 400	Jan 14
Dr. H. Stone	520 Medical Bldg.	$ 500	Jan 15
Mrs. A. Foster	77 Hill Rd.	$ 200	Jan 15
J. P. Morgan	1 Wall St.	$ 1,000	Jan 16
Mrs. C. Bell	412 W. Main St.	$ 300	Jan 16
F. W. Davis	1508 Oak Ave.	$ 450	Jan 17
Mrs. A. Clark	27 Elm Court	$ 200	Jan 17
S. L. Owens	903 Pine St.	$ 600	Jan 18
H. B. Smith	66 Old Mill Rd.	$ 150	Jan 18
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Jan 19
W. J. Price	1601 Main St.	$ 400	Jan 19
Dr. H. Stone	520 Medical Bldg.	$ 500	Jan 20
Mrs. A. Foster	77 Hill Rd.	$ 200	Jan 20
J. P. Morgan	1 Wall St.	$ 1,000	Jan 21
Mrs. C. Bell	412 W. Main St.	$ 300	Jan 21
F. W. Davis	1508 Oak Ave.	$ 450	Jan 22
Mrs. A. Clark	27 Elm Court	$ 200	Jan 22
S. L. Owens	903 Pine St.	$ 600	Jan 23
H. B. Smith	66 Old Mill Rd.	$ 150	Jan 23
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Jan 24
W. J. Price	1601 Main St.	$ 400	Jan 24
Dr. H. Stone	520 Medical Bldg.	$ 500	Jan 25
Mrs. A. Foster	77 Hill Rd.	$ 200	Jan 25
J. P. Morgan	1 Wall St.	$ 1,000	Jan 26
Mrs. C. Bell	412 W. Main St.	$ 300	Jan 26
F. W. Davis	1508 Oak Ave.	$ 450	Jan 27
Mrs. A. Clark	27 Elm Court	$ 200	Jan 27
S. L. Owens	903 Pine St.	$ 600	Jan 28
H. B. Smith	66 Old Mill Rd.	$ 150	Jan 28
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Jan 29
W. J. Price	1601 Main St.	$ 400	Jan 29
Dr. H. Stone	520 Medical Bldg.	$ 500	Jan 30
Mrs. A. Foster	77 Hill Rd.	$ 200	Jan 30
J. P. Morgan	1 Wall St.	$ 1,000	Jan 31
Mrs. C. Bell	412 W. Main St.	$ 300	Jan 31
F. W. Davis	1508 Oak Ave.	$ 450	Feb 1
Mrs. A. Clark	27 Elm Court	$ 200	Feb 1
S. L. Owens	903 Pine St.	$ 600	Feb 2
H. B. Smith	66 Old Mill Rd.	$ 150	Feb 2
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Feb 3
W. J. Price	1601 Main St.	$ 400	Feb 3
Dr. H. Stone	520 Medical Bldg.	$ 500	Feb 4
Mrs. A. Foster	77 Hill Rd.	$ 200	Feb 4
J. P. Morgan	1 Wall St.	$ 1,000	Feb 5
Mrs. C. Bell	412 W. Main St.	$ 300	Feb 5
F. W. Davis	1508 Oak Ave.	$ 450	Feb 6
Mrs. A. Clark	27 Elm Court	$ 200	Feb 6
S. L. Owens	903 Pine St.	$ 600	Feb 7
H. B. Smith	66 Old Mill Rd.	$ 150	Feb 7
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Feb 8
W. J. Price	1601 Main St.	$ 400	Feb 8
Dr. H. Stone	520 Medical Bldg.	$ 500	Feb 9
Mrs. A. Foster	77 Hill Rd.	$ 200	Feb 9
J. P. Morgan	1 Wall St.	$ 1,000	Feb 10
Mrs. C. Bell	412 W. Main St.	$ 300	Feb 10
F. W. Davis	1508 Oak Ave.	$ 450	Feb 11
Mrs. A. Clark	27 Elm Court	$ 200	Feb 11
S. L. Owens	903 Pine St.	$ 600	Feb 12
H. B. Smith	66 Old Mill Rd.	$ 150	Feb 12
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Feb 13
W. J. Price	1601 Main St.	$ 400	Feb 13
Dr. H. Stone	520 Medical Bldg.	$ 500	Feb 14
Mrs. A. Foster	77 Hill Rd.	$ 200	Feb 14
J. P. Morgan	1 Wall St.	$ 1,000	Feb 15
Mrs. C. Bell	412 W. Main St.	$ 300	Feb 15
F. W. Davis	1508 Oak Ave.	$ 450	Feb 16
Mrs. A. Clark	27 Elm Court	$ 200	Feb 16
S. L. Owens	903 Pine St.	$ 600	Feb 17
H. B. Smith	66 Old Mill Rd.	$ 150	Feb 17
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Feb 18
W. J. Price	1601 Main St.	$ 400	Feb 18
Dr. H. Stone	520 Medical Bldg.	$ 500	Feb 19
Mrs. A. Foster	77 Hill Rd.	$ 200	Feb 19
J. P. Morgan	1 Wall St.	$ 1,000	Feb 20
Mrs. C. Bell	412 W. Main St.	$ 300	Feb 20
F. W. Davis	1508 Oak Ave.	$ 450	Feb 21
Mrs. A. Clark	27 Elm Court	$ 200	Feb 21
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Mrs. A. Foster	77 Hill Rd.	$ 200	Feb 24
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Mrs. C. Bell	412 W. Main St.	$ 300	Feb 25
F. W. Davis	1508 Oak Ave.	$ 450	Feb 26
Mrs. A. Clark	27 Elm Court	$ 200	Feb 26
S. L. Owens	903 Pine St.	$ 600	Feb 27
H. B. Smith	66 Old Mill Rd.	$ 150	Feb 27
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Feb 28
W. J. Price	1601 Main St.	$ 400	Feb 28
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 1
Mrs. A. Foster	77 Hill Rd.	$ 200	Mar 1
J. P. Morgan	1 Wall St.	$ 1,000	Mar 2
Mrs. C. Bell	412 W. Main St.	$ 300	Mar 2
F. W. Davis	1508 Oak Ave.	$ 450	Mar 3
Mrs. A. Clark	27 Elm Court	$ 200	Mar 3
S. L. Owens	903 Pine St.	$ 600	Mar 4
H. B. Smith	66 Old Mill Rd.	$ 150	Mar 4
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 5
W. J. Price	1601 Main St.	$ 400	Mar 5
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 6
Mrs. A. Foster	77 Hill Rd.	$ 200	Mar 6
J. P. Morgan	1 Wall St.	$ 1,000	Mar 7
Mrs. C. Bell	412 W. Main St.	$ 300	Mar 7
F. W. Davis	1508 Oak Ave.	$ 450	Mar 8
Mrs. A. Clark	27 Elm Court	$ 200	Mar 8
S. L. Owens	903 Pine St.	$ 600	Mar 9
H. B. Smith	66 Old Mill Rd.	$ 150	Mar 9
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 10
W. J. Price	1601 Main St.	$ 400	Mar 10
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 11
Mrs. A. Foster	77 Hill Rd.	$ 200	Mar 11
J. P. Morgan	1 Wall St.	$ 1,000	Mar 12
Mrs. C. Bell	412 W. Main St.	$ 300	Mar 12
F. W. Davis	1508 Oak Ave.	$ 450	Mar 13
Mrs. A. Clark	27 Elm Court	$ 200	Mar 13
S. L. Owens	903 Pine St.	$ 600	Mar 14
H. B. Smith	66 Old Mill Rd.	$ 150	Mar 14
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 15
W. J. Price	1601 Main St.	$ 400	Mar 15
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 16
Mrs. A. Foster	77 Hill Rd.	$ 200	Mar 16
J. P. Morgan	1 Wall St.	$ 1,000	Mar 17
Mrs. C. Bell	412 W. Main St.	$ 300	Mar 17
F. W. Davis	1508 Oak Ave.	$ 450	Mar 18
Mrs. A. Clark	27 Elm Court	$ 200	Mar 18
S. L. Owens	903 Pine St.	$ 600	Mar 19
H. B. Smith	66 Old Mill Rd.	$ 150	Mar 19
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 20
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H. B. Smith	66 Old Mill Rd.	$ 150	Mar 24
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 25
W. J. Price	1601 Main St.	$ 400	Mar 25
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 26
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Mrs. C. Bell	412 W. Main St.	$ 300	Mar 27
F. W. Davis	1508 Oak Ave.	$ 450	Mar 28
Mrs. A. Clark	27 Elm Court	$ 200	Mar 28
S. L. Owens	903 Pine St.	$ 600	Mar 29
H. B. Smith	66 Old Mill Rd.	$ 150	Mar 29
Mrs. E. Rogers	Rogers Dept. Store	$ 175	Mar 30
W. J. Price	1601 Main St.	$ 400	Mar 30
Dr. H. Stone	520 Medical Bldg.	$ 500	Mar 31
Mrs. A. Foster	77 Hill Rd.	$ 200	Mar 31
J. P. Morgan	1 Wall St.	$ 1,000	Apr 1
Mrs. C. Bell	412 W. Main St.	$ 300	Apr 1
F. W. Davis	1508 Oak Ave.	$ 450	Apr 2
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Mrs. E. Rogers	Rogers Dept. Store	$ 175	Apr 4
W. J. Price	1601 Main St.	$ 400	Apr 4
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Mrs. A. Foster	77 Hill Rd.	$ 200	Apr 5
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S. L. Owens	903 Pine St.	$ 600	May 3
H. B. Smith	66 Old Mill Rd.	$ 150	May 3
Mrs. E. Rogers	Rogers Dept. Store	$ 175	May 4
W. J. Price	1601 Main St.	$ 400	May 4
Dr. H. Stone	520 Medical Bldg.	$ 500	May 5
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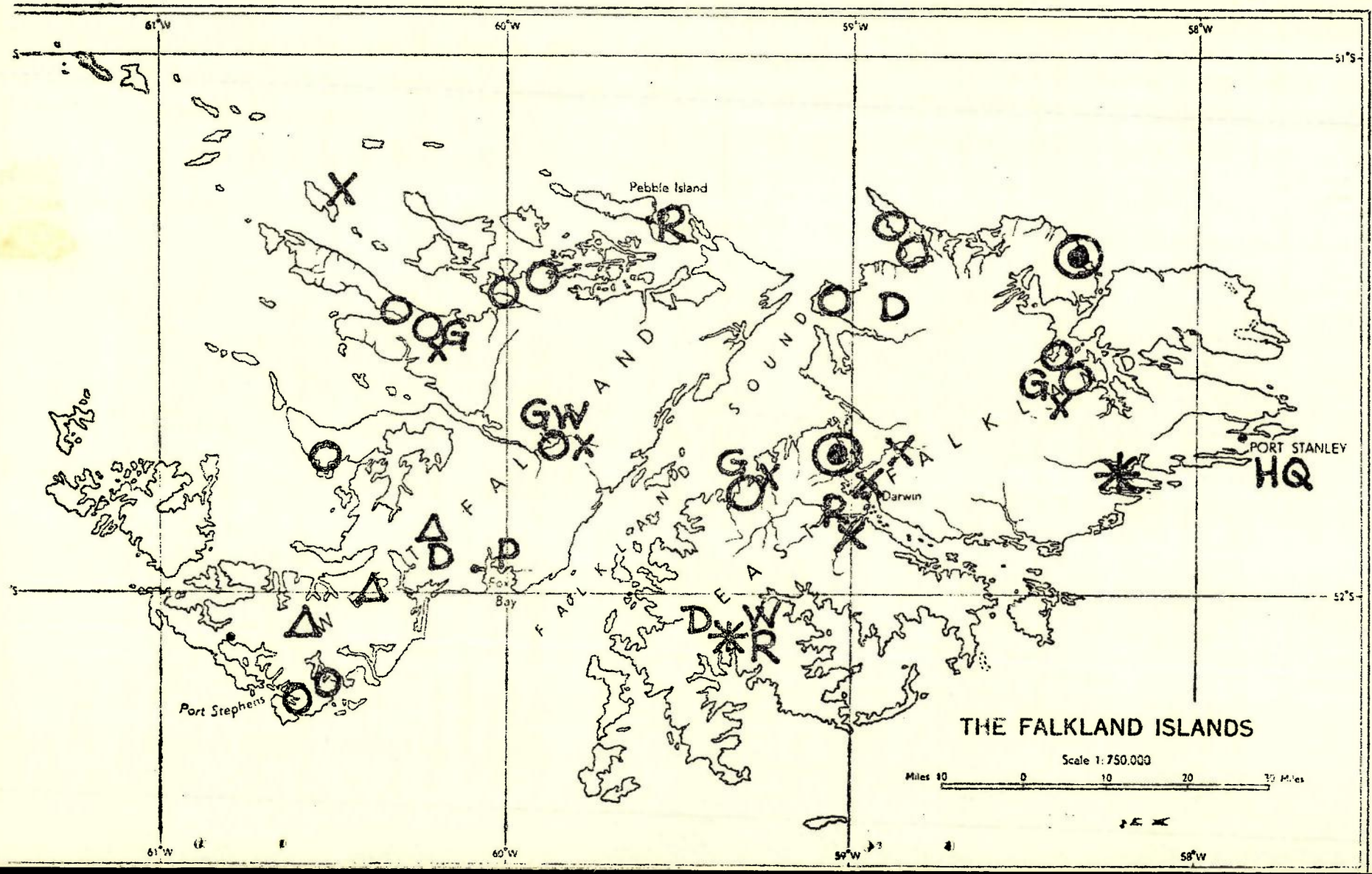
PROGRAMME OF WORK: G.T.U.

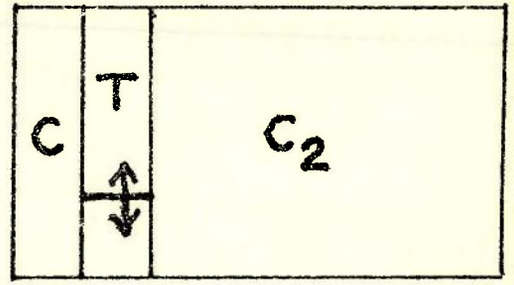
TITLE		STAFF	CODE
1. SYSTEMS			
2 MAIN 2 P. EXPERIMENTS		CDK TPM	1.1, 1.2
2 DRY SHEEP EXPERIMENTS		CDK TPM	1.3, 1.4
EXTENSION SCHEME	EWES	CDK TPM	1.5
EXTENSION SCHEME	WETHERS ETC.	CDK MRB	1.6
SYSTEMS DESIGN		CDK MRB RSW	1.7
INVESTMENT APPRAISAL ETC		CDK	1.8
DATA HANDLING		TPM	1.9
2. AGRONOMY			
RE-SEEDING ST. 1		MRB ASG CDK	2.1
RE-SEEDING ST. 2		MRB ASG CDK	2.2
WHITEGRASS STUDIES		MRB ASG CDK	2.3
SOILS STUDIES		MRB ASG	2.4
VEGETATION MONITORING		MRB	2.5
GROSS WEATHER EFFECTS		MRB TPM	2.6
VEG MAPPING (SUPERVISORY)		MRB	2.7
3. ANIMAL PRODUCTION			
WOOL GROWTH		TPM RSW CDK	3.1
PERFORMANCE ASSOC. WITH NUTRITION		RSW MRB CDK	3.2
PHYSIOLOGY - DESCRIPTIVE		RSW TPM ASG	3.3
INTERPRETATION OF LOSS RATES		RSW TPM	3.4
REPRODUCTION		RSW CDK	3.5
BREED IMPROVEMENT		RSW CDK	3.6
GROSS WEATHER EFFECTS		TPM RSW	3.7
BIOCHEMICAL PARAMETERS		ASG RSW	3.8
4. ANIMAL HEALTH			
DISEASE CONTROL (ALL ANIMALS)		RSW ASG	4.1
DEFICIENCY DISEASE		RSW ASG MJV	4.2
BIOCHEMICAL PARAMETERS		ASG RSW	4.3
ENDOPARASITISM		RSW ASG	4.4
EFFECT ON PRODUCTION		RSW	4.5
5. LABORATORY STUDIES			
DISEASE CONTROL		ASG RSW	5.1
FEED EVALUATION		ASG	5.2
MICROBIOLOGY		ASG MRB	5.3
SOILS STUDIES		ASG MRB	5.4
6. GOOSE STUDY			
GROUND TRANSECTS		RWS	6.1
AERIAL TRANSECTS		RWS MRB TPM	6.2
BREEDING BIOLOGY		RWS	6.3
SOCIAL ORGANISATION		RWS	6.4
INTAKE STUDIES		RWS CDK MRB ASG	6.5
COMPETITIVE FACTORS		RWS CDK MRB	6.6

GRASSLANDS TRIALS UNIT 1979

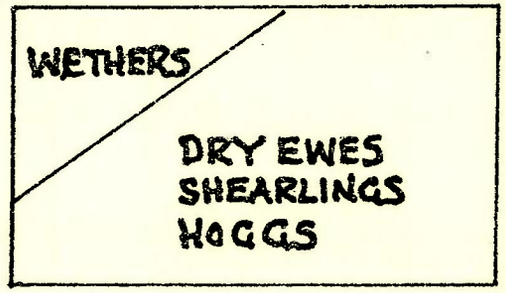
- ⊙ TWO MAIN 2-PASTURE EWE EXPERIMENTS
- O EWE EXTENSION SCHEME SITES
- ✳ TWO DRY SHEEP EXPERIMENTS
- D DRY SHEEP EXTENSION SCHEME
- X INTENSIVE GOOSE STUDY AREAS
- P PRE-PARTUM FEEDING EXPERIMENT
- R REPRODUCTION EXPERIMENTS
- W WHITEGRASS STUDIES
- G PRINCIPLE RE-SEEDING SITES
- Δ DEFICIENCY DISEASE AREAS



⊙ EWES



✳ DRY SHEEP



1975/76

The sheep year commences May and the winter May-Sep '75 was slightly warmer than the average compared to MET/GTU Sep '77 MEANS 1954-63 (see Appendix). The 4" soil reading (Stanley) fell below 5.5°C on 8 April '76 (5 days late) and rose 13 Oct '75 (4 days before the Mean). Rainfall May '75-April '75 was 625.9mm (Mean 580.7mm). Windspeed was well below average. Radiation was above in winter, below in early summer and above average in late summer. Sunshine was below the mean in winter and above in summer. Rain distribution was about average in winter and well above in summer.

1976/77

The air temperatures were average, except when above in late summer. The 4" soil reading fell at the normal time and rose on 21 Oct '76 (4 days late). The soil temperatures in summer were well above the mean. Windspeed was below in winter and above in summer. Radiation was average in winter and well below average in summer. Sunshine was above average in winter and below in summer. Rain distribution was average in winter and above average in summer.

1977/78

During the winter temperatures were below average permitting little or no growth to occur. Rainfall, sunshine were average and windspeeds below. Radiation was slightly above normal. The 4" soil reading fell below 5.5°C on 1 May '77 (8 days late) and rose on 23 Oct '77 (6 days late). In summer air temperatures were well above average, as were the soil temperatures. Rainfall and sunshine were normal; wind above average and radiation above during the first half of summer and below during the second half.

1978/79

The winter May-Sep was slightly milder than average permitting occasional growth. Temperatures were average, rainfall below normal and windspeeds above. The 4" soil reading fell on 26 April '78 (3 days late) and rose on 5 Oct '78 (12 days early). Radiation during the winter was below average, but sunshine about average. Summer temperatures were higher than normal; rainfall greater during the whole summer, but December was below normal. Windspeed was average, sunshine below average as was radiation. 4" soil temperatures during summer were well above average. The summer ended on 29 April '79 (6 days late).

The Met Station is situated in Port Stanley and there are fairly wide mean temperature and rainfall differences throughout the country:

	Percentage of P. Stanley rainfall	Percentage of P. Stanley 4" soil M (summer)
West Point	91%	108%
Fox Bay	76%	107%
Fitzroy	89%	105%

Comparison between Stanley, Fox Bay and West Point sunshine records shows Stanley to have slightly higher sunshine in winter (about 0.2 hrs daily) but to be about 0.5 to 0.8 hrs lower in summer than the West. Result - over the year Fox Bay has 0.2 hrs longer than Stanley; West Point 0.4 hrs longer than Stanley daily.

As is to be expected, the resultant 4" soil temperatures remain above 5.5 longer at these and similar locations than Port Stanley by up to a week at the start of summer and probably two or three weeks at the end.

REVIEW 1975/76

C. D. Kerr (Sheep Management Specialist and Team Leader arrived in July 75 and at this time the Goose Study became a part of GTU. On completing a familiarisation tour, the sites for 1.1 (Salvador) and 1.2 (Brenton Loch) were selected. Botanical transects were laid out in Moody Valley, Port Stanley - Bluff Cove and Fitzroy, extending to Bertha's Beach.

The Goose Officer, J. Harradine, having arrived in March 74 completed the period on Carcass Island (Aug 74 - Apr 76) and left in June 76 (to complete the writing up in UK).

On his appointment as Consultant Supervisor, Goose Study, Prof. G. M. Dunnet visited in February 76.

The Consultant Supervisor, T. H. Davies visited in March, April 76 the principal sites (1.1, 1.2), some of the areas scheduled for the Ewe Extension Scheme (1.5) and experimental sites of Young (65 - 68) and Davies et al (69/70). A priority list of work was prepared and Phase One set out.

Dr. M. A. Gemmell (Hydatid Research Unit, N.Z.) reported on his visit (Dec 75).

The FISOA/GTU Sub-committee was inaugurated in Aug 75 to permit close liaison between the two organisations, and GTU is grateful for the continuing support and advice since this time from S. Miller C.B.E., J.P., (Chairman), W. H. Goss M.B.E., J.P., and R. W. Hills.

During the visit of the Shackleton Team (Jan 76) close cooperation was maintained particularly with Dr. H. Ll. Williams.

Kerr collaborated with Messrs Blake, Felton and Miller to produce the "SOA Sub-committee: Reports Report, July 76".

The Preliminary Report of GTU was published in November 75.

The Annual Report GTU 75/76 included the preliminary data from 1.1, 1.2, the initial sites for 1.5, proposals for 1.3, 1.4, Agronomy (Section 2) results and proposals for the future, and Veterinary Studies (now Animal Health, Section 4) proposals.

J. H. McAdam (Pasture Agronomist) arrived January 76
R. S. Whitley (Veterinary Officer) arrived June 76.

REVIEW 1976/77

The first year of 1.1 and 1.2 was completed and ten ewe flocks recruited for 1.5, two of which were subsequently dropped. 1.3, the Dry Sheep Experiment at North Arm was put in readiness for commencing 77/78 Sheep year. The theory of the Dry Sheep Extension Scheme (1.6) was prepared and the publishing of "The Revenue of Falkland Island Sheep", (Jan 77) prefaced subsequent work in Section 1.7 (Investment Appraisal, etc.). Section 2 continued with a wide range, including the vegetation mapping of considerable areas. Sections 4 and 5 included much investigational work which included the start of Brucella ovis eradication. Government was persuaded to replace Scolaban with Droncit in May 77 for the anti-Hydatid dog dosing programme.

Close cooperation was maintained with SOA through the Sub-committee during the year and papers read and discussions were held during Farmers Week (July 76).

Extensive alterations to H.Q. (part of the Met Station) commenced in 76, much of the work being done by R. S. Whitley.

The "Preliminary Report on the Feasibility, Cost and Benefits of an all-weather Track from Stanley to Darwin" was submitted by Kerr to H. E. The Governor in March 77.

The GTU Report 76/77 included the first seasons results from 1.1, 1.2; the Work Schedules for 1.3, 1.4; short descriptions of 1.5 Ewe Flocks; Grazing Theory 1.6/1.7; Revenue calculations 1.8. Arrangements were completed with HFRO to permit the handling of Data at the Edinburgh Regional Computing Centre. Section 2 (Agronomy) continued with the addition of direct drilling trials; effects of burning whitegrass; the Arroyos experiment and reseed renovation trials. Section 3 (Animal Production) now included a modified dye-banding of wool technique (3.1) and a pilot trial concerned with the examination of ovaries from slaughtered ewes (3.5).

Section 4 (Animal Health) now included a self-financing Veterinary Diagnostic Service; further major and trace element investigations; vitamin and mineral trials; advice to Government on disease prevention and control; work on eradication of Brucella ovis and Hydatidosis; a T. hydatigena infestation survey in dogs; a Patagonian fox survey (Weddell Island) and the provision of stocks of drugs at farms that may be used on Veterinary advice.

Section 5 (Laboratory Studies) was mainly concerned with Section 4 (Brucella ovis, blood values, worm egg counts, copper and calcium estimations, bacterial sensitivity to antibiotics, ketone investigations) but some botanical separations were performed, and viability studies of rhizobia commenced.

Miss H. Rogers (Biochemist) arrived in March 77.

REVIEW 1977/78

The second year of 1.1, 1.2 was completed and eight ewe flocks maintained for 1.5 (Ewe Extension Scheme). The Dry Sheep Experiment at North Arm (1.3) completed its first year and Fitzroy (1.4) was made ready for 78/79, all classes of stock being gathered from the Farm when available.

The Agronomy activities and results are submitted separately for 75-78 and a Summary is included in this Report.

Section 3 included the commencement of the Peri-natal Mortality Pilot Scheme on several farms and the Ovulation Rate Study at North Arm commenced in April 78. All sheep at North Arm 1.3 were dye-banded, and a proportion of those at 1.1, 1.2 in connection with Wool Growth 3.1.

Section 4 (Animal Health) included a number of Public Health and disease control recommendations, and work was continued on studies relating to levels of major and trace elements in sheep and the control of Brucella ovis and Hydatidosis.

Most Farmers visited GTU throughout the year when in Stanley, and during Farmers Week (July 77) all SOA Members attending were conducted around H.Q. which by this time had undergone alterations providing:-

1. Plants and soils handling room (freezers, balance, oven)
2. Agronomy room (map bench, map and air photo library)
3. General office (files, typewriters, library)
4. Office and meeting room
5. Office (biochemistry, instruments, balance etc)
6. Small laboratory
7. Veterinary office and surgery (drug and instrument store)
8. Loft (store-room)
9. Garage (store-room)

With the arrival of the Goose Officer the Study re-commenced, the centre being Darwin as recommended by the Dunnet Reports of March and October 76.

The Unit was visited in January/February 78 by:-

J. Eadie HFRO
Prof. G. M. Dunnet (Consultant Supervisor, Goose Study)
R. L. Waddell (Agricultural Adviser, ODA)

Many recommendations were made and were adopted as soon as possible.

In June 77 HFRO was visited by those Farmers on leave in UK.

No Report was issued for the year 77/78 due to the necessity of submitting Project Proposals to the Committee for approval and the agreement of GTU Staff Members to the revised Work Schedule.

The paper "The Potential Net Increase in Agricultural Output which could be achieved with a road from Port Stanley to Darwin and the relevant constraints" was submitted by Kerr to FI Government in December 77.

R. W. Summers (Goose Officer) arrived September 77
T. P. Maitland (Field Officer) arrived October 77
J. H. McAdam (Agronomist) departed May 78

REVIEW 1978/79

The third year of 1.1, 1.2 was completed with modifications to the mating, lambing dates (see Eadie Report 78) to bring mating to the beginning of June, lambing the beginning of November (approximately 3 weeks earlier). The Dry Sheep Experiment N.A. (1.3) completed the second year and Fitzroy (1.4) the first modifications were made to stocking rates at 1.1, 1.2, 1.3 and 1.4 during the year (see Eadie Report 78, Davies Report 79).

The Ewe Extension Scheme was expanded as a result of the London July 78 Committee Meeting to thirteen (13) flocks to permit the introduction of Stage One Reseed (1.5/2.1) (Eadie 78, Davies 78, 79) at Roy Cove, Darwin, Chartres and Teal Inlet.

Section 2 (Agronomy) was limited to this work. Section 3 (Animal Production) was expanded to include the dye-banding of all sheep in 1.1, 1.2, 1.3 and 1.4; the third season of 3.2; 3.5 at Darwin and Pebble and published papers on 3.6 (Breed Improvement).

Section 4 was enhanced by the visit of M. J. Vagg (Compton) who now arranges for the analyses (4.2).

Section 5 activities were limited by the departure due to ill health of Miss H. Rogers in January 79.

Section 6 (Goose Study) progressed on both main Islands, but only one subsequent air transect was possible (6.2) severely limiting this aspect.

The Unit was visited by T. H. Davies (Consultant Supervisor) in January/February 79 when all projects were discussed and visits made to all the major sites.

Advice on the preparation of the seed-beds (1.5/2.1) was given and subsequent sowing procedure was based upon his recommendations.

In July 78 those Farmers on leave in UK visited HFRO.

Miss H. Rogers (Biochemist) departed Jan 79
Miss M. R. Burkett (Pasture Agronomist) arrived Apr 79
A. S. Grieve (Microbiologist/Biochemist) arrived May 79

The Unit was visited by Prof. G. M. Dunnet (Consultant Supervisor, Goose Study) in January/February 79.

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FALKLAND ISLANDS

Farming Statistics

for the year

1977/78

FARMING STATISTICS FOR 1977-78

Prepared from information furnished in accordance with Section 40 of the Live Stock Ordinance, Cap. 40.

Owner	Name of Station	Rams	Ewes			Wethers	Hoggets	Total	Sheep Shorn
			Breeding	Cast	Maiden				
EAST FALKLAND									
H. & R. Hills	Moody Valley *	30	626	95	162	1,210	489	2,612	2,604
San Carlos Sheep Farming Co., Ltd.	San Carlos	401	8,964	293	2,250	8,750	5,816	26,474	23,675
R. M. Pitaluga & Co., Ltd.	Gibraltar	180	5,281	93	1,273	6,575	3,708	17,110	15,915
Falkland Islands Co., Ltd.	Darwin & Walker Creek	1,376	34,254	536	8,463	37,337	19,759	101,725	92,706
" " " "	Fitzroy	320	9,022	* 881	2,433	5,741	6,293	24,690	21,648
" " " "	Green Patch	112	3,574	† 3,138	1,134	6,484	2,572	17,014	15,423
Smith Bros.	Berkeley Sound	171	5,809	135	1,343	5,309	3,199	15,966	13,733
R. W. Browning	Mullet Creek	46	660	60	120	324	228	1,438	1,190
Mrs. S. R. Stewart	Bluff Cove	65	2,110	—	307	621	743	3,846	2,699
Port Louis Ltd.	Port Louis	176	4,156	240	849	3,657	2,288	11,366	9,686
Douglas Station, Ltd.	Douglas	188	6,020	295	1,260	5,875	2,812	16,450	14,005
Port San Carlos, Ltd.	Port San Carlos	330	11,115	850	3,144	9,230	7,885	32,554	28,284
Teal Inlet, Ltd.	Evelyn	363	8,369	* 366	2,021	5,530	4,929	21,578	19,659
Estate H. J. Pitaluga	Rincon Grande	106	2,634	496	475	3,305	1,450	8,466	8,059
C. Bundes & R. Hills	Sparrow Cove	14	500	—	—	296	72	882	844
Falkland Islands Co., Ltd.	North Arm	702	21,798	1,350	6,067	23,825	13,296	67,038	58,654
R. J. & P. Goss	Bluff Cove Mountain	1	350	1,666	—	95	48	2,160	838
		4,581	125,242	10,494	31,301	124,164	75,587	371,369	329,622

* Includes Port Harriet Farm

* 100 Dry † 2,727 Dry

WEST FALKLAND									
J. L. Waldron, Ltd.	Port Howard	359	13,673	—	3,502	12,030	8,046	37,610	33,774
Holmested Blake & Co., Ltd.	Hill Cove	424	11,693	430	2,934	13,140	7,265	35,886	32,197
Falkland Islands Co., Ltd.	Port Stephens	259	12,696	—	1,837	10,231	6,701	31,724	26,337
Falkland Islands Co., Ltd.	Fox Bay West	320	10,221	111	2,419	9,869	6,504	29,444	26,020
Packe Bros. & Co. Ltd.	Fox Bay East	334	9,849	50	2,451	9,794	5,998	28,476	24,619
Chartres Sheep Farming Company, Ltd.	Chartres	445	8,726	* 1,060	2,535	8,940	5,663	27,369	24,765
Bertrand & Felton, Ltd.	Roy Cove	277	5,965	20	1,553	6,075	4,236	18,126	17,957
		2,418	72,823	1,671	17,231	70,079	44,413	208,635	185,669

* Dry

ISLANDS									
J. Hamilton, (Estates) Ltd.	Weddell Group	141	† 3,606	191	924	3,304	2,222	10,388	8,491
" " " "	Saunders	130	2,960	—	393	2,571	1,469	7,523	6,308
Dean Bros. Ltd.	Pebble	148	4,492	724	1,358	3,357	3,937	14,016	12,422
R. McGill	Carcass	12	460	* 115	202	792	407	1,988	1,835
New Is. Preservation Ltd.	New	9	512	40	247	918	440	2,166	2,429
T. C. Clifton	Sea Lion	9	390	89	131	691	300	1,610	1,535
R. B. Napier	West Point	27	540	—	350	819	437	2,173	2,211
Falkland Islands Co., Ltd.	Speedwell Group	86	2,840	1,041	1,121	4,796	2,187	12,071	10,634
W. MacBeth	Sedge	12	150	191	43	492	95	983	943
Falkland Islands Co., Ltd.	Lively/Bleaker Gp.	90	2,350	60	807	3,514	1,606	8,427	7,354
S. R. & C. Miller	Keppel	28	860	190	270	1,241	803	3,392	2,761
F. Hirtle	Golding Group	—	—	—	—	3,386	—	3,386	3,224
A. Felton	Split	5	124	—	—	—	110	239	129
		697	19,284	2,641	5,846	25,881	14,013	68,362	60,276

† 105 Dry * Dry

SUMMARY 1973–78

East Falkland	4,581	125,242	10,494	31,301	124,164	75,587	371,369	329,622
West Falkland	2,418	72,823	1,671	17,231	70,079	44,413	208,635	185,669
Islands	697	19,284	2,641	5,846	25,881	14,013	68,362	60,276
Totals 1977–1978	7,696	217,349	14,806	54,378	220,124	134,013	648,376	575,567
1976–1977	7,951	215,144	19,828	59,421	209,783	125,989	638,116	564,143
1975–1976	7,872	218,512	13,921	60,271	212,241	131,902	644,819	580,724
1974–1975	8,020	218,460	11,606	60,968	209,506	135,454	644,014	565,631
1973–1974	7,786	220,876	15,556	50,856	200,761	132,312	628,147	553,285

Total wool clip in 1000 lbs	Lambs		Sheep disposed of	Horses	Cattle	Dogs	Poultry	Swine	Acres cultiv-ated	Labour	Ear Mark
	Marked	Dipped									
EAST FALKLAND											
21.0	555	489	237	7	123	—	—	—	—	4	Fork & Slit
189.6	6,175	5,816	1,971	137	514	44	275	—	86	17	Fore Bayonet
126.0	3,974	3,687	1,958	43	108	16	84	—	6	9	Fore Bayonet
727.9	22,818	19,759	6,657	424	1,678	125	—	7	—	58	Double Swallow
170.0	6,907	6,293	3,078	138	244	41	190	—	—	16	,, ,,
128.9	2,917	2,572	1,259	54	321	41	85	1	—	9	,, ,,
106.0	3,568	3,568	408	51	217	22	75	—	—	5	Triangle
5.2	268	—	141	—	19	3	21	—	—	2	Back Bayonet
18.7	755	743	119	6	40	6	41	—	—	2	Fore Bayonet &
75.0	2,392	2,288	367	28	101	12	—	—	—	4	Fork [Back Slit
97.5	3,043	2,812	587	144	—	22	29	—	—	8	Fork
232.0	8,618	7,885	2,580	124	680	45	203	2	—	18	Slit
147.0	5,604	4,929	1,543	94	284	22	129	—	1.5	13	Back Square
67.9	1,450	—	762	64	72	8	120	8	—	4	Slit
8.5	187	72	222	7	28	—	—	—	—	3	Fore Bayonet
437.8	14,804	13,296	2,679	303	812	76	498	—	—	30	Double Swallow
3.1	—	48	—	—	—	—	—	—	—	—	Half Half-penny
2,562.1	84,035	74,257	24,568	1,624	5,241	483	1,750	18	93.5	202	
WEST FALKLAND											
274.2	8,696	8,046	3,320	179	767	58	—	6	366	25	Fork
264.4	8,055	7,265	4,073	95	371	53	—	1	—	22	Fore Bayonet
195.8	6,724	6,701	963	106	251	37	111	3	—	15	Double Swallow
211.9	6,642	6,504	2,967	88	156	21	—	—	—	17	Fore Bayonet
221.5	6,461	5,998	3,220	118	529	30	—	—	—	21	Fore Bit
206.8	6,172	5,788	2,480	121	447	35	262	—	105	16	Double Swallow
156.8	4,432	4,236	4,188	72	197	33	—	—	—	12	Front Square
1,531.4	47,182	44,538	21,211	779	2,718	267	373	10	471	105	
ISLANDS											
71.1	2,295	2,222	869	57	156	15	45	3	—	10	Fork
46.3	1,485	1,469	455	31	118	14	—	—	5	5	,,
106.0	4,036	3,937	2,050	58	252	22	196	1	12	12	Back Bayonet
17.7	436	—	233	2	19	6	44	—	—	1	Fore Bayonet
24.8	501	440	592	2	27	4	27	—	—	1	Fork
18.5	310	300	226	6	10	1	12	—	—	1	Plain Ear
21.0	437	435	217	3	34	7	38	—	—	1	Back Square
118.5	2,399	2,187	1,447	12	164	*	—	—	—	3	Double Swallow
8.3	95	—	50	—	13	2	17	—	—	1	Fore Bayonet
69.2	1,702	1,606	689	12	26	21	—	—	—	5	Double Swallow
28.7	803	—	172	7	59	6	34	—	—	1	Back Square
26.4	—	—	25	2	13	5	16	—	—	1	—
1.4	103	—	15	—	—	—	—	—	—	—	—
557.9	14,602	12,596	7,040	192	891	103	429	4	17	43	

* Included in Lively/Bleaker Group

2,562	84,035	74,257	24,568	1,624	5,241	483	1,750	18	93.5	202
1,531	47,182	44,538	21,211	779	2,718	267	373	10	471	105
558	14,602	12,596	7,040	192	891	103	429	4	17	43
4,651	145,819	131,391	52,819	2,595	8,850	853	2,552	32	581.5	350
4,572	136,547	120,419	52,928	2,621	9,111	830	3,170	25	1,439	338
4,938	144,571	131,614	59,498	2,687	9,341	820	2,109	24	13,850	330
4,715	148,594	133,280	56,279	2,754	9,462	856	2,399	28	13,656	360
4,389	147,391	129,703	48,483	2,874	9,128	845	2,752	42	12,261	382

SHEEP DISPOSED OF

	Sold Locally for Breeding or further use	Slaughtered				Exported
		Mutton (Stanley)	Mutton (Farm)	Skins	Other Purposes	
East Falkland	2,414	4,337	7,345	8,669	1,803	—
West Falkland	—	1,209	4,855	13,657	1,490	—
Islands	630	872	1,322	2,836	1,380	—
Total 1977–1978	3,044	6,418	13,522	25,162	4,673	—
1976–1977	5,797	9,172	13,355	23,402	1,202	—
1975–1976	1,023	7,188	15,191	30,069	6,027	—
1974–1975	4,947	8,282	13,801	28,692	557	—
1973–1974	6,991	8,381	12,684	18,983	926	518

METEOROLOGICAL DATA OF AGRICULTURAL SIGNIFICANCE

FROM PORT STANLEY, FALKLAND ISLANDS.

Joint publication of the
Grassland Trials Unit and
the Meteorological Office,
Stanley.

SEPTEMBER 1977.

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Introduction.

In attempting to define the interactions and performances of plants and animals - such as occur in agricultural systems - detailed knowledge of relevant climatic variables must be available.

These tables represent an accumulation of data on a number of climatic variables considered relevant to defining the environment in which plants and animals live in the Falkland Islands.

General Information.

Meteorological observations quoted have been recorded at Port Stanley, Latitude 51° 42'S, Longtitude 57°52'W.

Effective height of anemometer = 10 metres.

All temperatures are given in degrees centigrade (°C).

The Zone times corresponding to 1200, 1800, 2300 and 0000 GMT respectively are GMT-4 = 0800, 1400, 1900 and 2000.

Where available, information has been calculated for the 10 year period 1954 - 1963. The selection of these years was governed by the following proceedure:- an exceptionally severe year (climatically) was selected (1959) and information accumulated and averaged for the 5 years before, and 4 years after, that year.

Notes on Tables.

Table 1. Information contained has been obtained from "The Meteorology of the Falkland Islands and Dependencies 1944 - 1950" by J. Pepper, London (1954).
The length of day at any place depends on its latitude and in the Southern Hemisphere the longest day occurs in the summer about Dec. 21st and in the winter, the shortest day about June 21st. The approximate local mean times of sunrise and sunset on March 21st; June 21st; September 21st; and December 21st; for Stanley are given. The altitude of the sun at local noon has also been given. This was calculated from $90^{\circ} - (A - B)$ where A = latitude of the place and B = declination of the sun, no correction being made for refraction effect.

Table 2. Total and maximun radiation measurements only commenced in 1957.

Table 3 & 4. These tables have been included to provide information for Foresters and others interested in the growth of deep rooted plants.

Table 5. On the basis of the threshold temperature for grass growth being 5.5°C (Calder and Davies, 1965. Journal of the British Grassland Society 20 194 - 6) it can be seen that the mean length of the growing season at Port Stanley is 176 days i.e. from 16th October to 23rd April.

Table 7. Although vapour pressure data (Table 8) has been quoted, information on Relative Humidity is often more easily understood and interpreted by agriculturalists.

Table 11. Reproduced from "The Meteorology of the Falkland Islands and Dependencies 1944 - 1950" by J. Pepper, London (1954). Information on wind direction is of value in the planning of shelterbelts and the management of stock at vunerable stages in their life cycles.

Stanley experiences strong winds from a westerly point in all months; winds from all other directions do occur, but their frequency is small compared with the westerlies. The strongest winds occur in November; gales are likely to occur in every month but their frequency is not high.

Approximately 50% of the winds during the year are between Southwest and Northwest. The frequency of easterly winds is 6% and the percentage of gales is 2.5%. The figure in the centre of the rose represents the percentage of calms. The mean annual % calms is 1.3%.

Directions on wind roses are as follows (clockwise from vertical upright);
350° - 10°; 20° - 40°; 50° - 70°; 80° - 100°; 110° - 130°; 140° - 160°;
170° - 190°; 200° - 220°; 230° - 250°; 260° - 280°; 290° - 310°; 320° - 340°.

TABLE 1. DAYLENGTH AT STANLEY (LATITUDE 51°42'S)

MARCH 21			JUNE 21			SEPTEMBER 21			DECEMBER 21		
SUN RISE	SUN SET	ALT	SUN RISE	SUN SET	ALT	SUN RISE	SUN SET	ALT	SUN RISE	SUN SET	ALT
h m	h m		h m	h m		h m	h m		h m	h m	
6 01	18 13	38°18'	8 08	15 55	14°51'	5 52	17 55	38°18'	3 27	20 19	61°45'

SUNSHINE AND RADIATION DATA

TABLE 2 A. MEAN HOURLY SUNSHINE 1954 - 1963

MONTH	Hour 3-4	Hour 4-5	Hour 5-6	Hour 6-7	Hour 7-8	Hour 8-9	Hour 9-10	Hour 10-11	Hour 11-12	Hour 12-13	Hour 13-14	Hour 14-15	Hour 15-16	Hour 16-17	Hour 17-18	Hour 18-19	Hour 19-20	Hour 20-21	AVERAGE
JAN.		.10	.27	.34	.43	.47	.47	.50	.51	.49	.46	.44	.44	.41	.40	.33	.11		6.17
FEB.		.01	.21	.37	.43	.48	.51	.52	.50	.51	.50	.44	.46	.43	.36	.19	.08		6.00
MAR.			.01	.21	.39	.46	.50	.49	.51	.53	.53	.50	.51	.46	.20	.01			5.31
APR.*				.01	.20	.38	.44	.46	.46	.46	.44	.40	.39	.21	.01				3.86
MAY.					.04	.19	.30	.36	.39	.40	.37	.32	.19	.01					2.57
JUNE.						.08	.22	.29	.34	.35	.31	.25	.08						1.92
JULY.					.01	.14	.27	.35	.37	.35	.33	.25	.11						2.18
AUG.*				.01	.11	.27	.35	.40	.40	.39	.37	.32	.24	.09					2.95
SEPT.				.09	.28	.39	.44	.46	.47	.45	.45	.43	.37	.28	.06				4.17
OCT.			.01	.37	.48	.51	.56	.59	.60	.61	.57	.54	.53	.46	.33	.10			6.26
NOV.		.06	.27	.39	.45	.48	.50	.49	.53	.55	.51	.50	.49	.46	.42	.30	.06		6.46
DEC.		.17	.33	.38	.43	.46	.48	.49	.51	.51	.49	.48	.47	.43	.36	.30	.13		6.42

* APRIL - 9YR AV (-63)
AUGUST - 9YR AV (-61)

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TABLE 2 B. MEAN DAILY TOTAL RADIATION 1957 - 1963

($MW\ cm^{-2}\ Day^{-1}$)

JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
50.3	44.9	32.8	19.8	10.4	6.7	8.0	14.5	26.9	43.7	52.4	59.1
52.9	43.2	30.8	18.4	9.8	6.4	7.9	15.1	26.9	40.6	51.5	57.5

* 20 Year Means 1957-76.

TABLE 2 C MEAN MAXIMUM DAILY TOTAL RADIATION 1957 - 1963

($MW\ cm^{-2}\ Day^{-1}$)

JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
86.1	73.1	55.9	35.9	19.8	11.9	17.2	26.7	49.1	71.6	82.6	93.7
84.8	71.5	54.8	34.6	19.4	11.6	16.2	28.6	47.0	67.4	81.9	89.7
90.4	86.0	64.0	40.5	23.5	13.5	19.2	33.0	53.8	82.2	89.3	97.5

20 Year Mean 1957-76

* Absolute Daily Maximum 1957-76

TABLE 3 MEAN MONTHLY 20cm SOIL TEMPERATURES (°C) (1954 - 1963)

JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
9.7	9.8	8.6	6.7	4.9	3.4	2.8	2.8	3.8	5.7	7.7	8.9

TABLE 4 MEAN MONTHLY 30cm SOIL TEMPERATURES (°C) (1954 - 1963)

JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
9.2	9.3	8.4	6.7	5.0	3.6	3.0	2.9	3.8	5.5	7.3	8.5

TABLE 5

4 inch Soil Temperature (°C) At Stanley Average Daily Temperature 1954 - 1963

	JAN.	FEB.	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
01	7.4	10.4	9.1	7.0	5.0	3.4	2.2	2.1	2.8	4.3	6.9	8.0
02	4.7	10.1	9.0	7.2	4.8	3.2	2.1	2.3	2.7	4.4	7.1	8.5
03	9.4	10.1	9.1	6.7	4.4	3.0	2.2	2.2	2.7	4.7	6.9	8.3
04	9.4	9.9	9.0	6.7	4.7	3.3	2.2	2.1	2.7	4.8	7.0	8.5
05	9.5	10.2	8.6	6.4	4.7	3.3	2.2	2.0	2.5	4.9	7.2	8.5
06	9.6	10.1	8.8	6.4	4.8	3.2	2.1	2.1	2.6	4.7	7.1	8.7
07	9.6	10.2	8.8	6.3	4.6	3.1	2.5	2.1	2.8	4.7	7.2	8.9
08	9.2	9.8	8.6	6.1	4.5	2.8	2.3	2.2	2.9	5.0	7.4	8.6
09	9.2	9.6	8.4	6.1	4.3	2.6	2.2	2.2	2.7	5.0	7.7	8.8
10	9.0	9.8	8.6	6.3	4.3	2.6	2.6	2.2	3.0	5.2	7.8	8.9
11	9.2	9.7	8.7	6.3	4.2	2.3	2.1	2.2	3.1	5.3	7.7	9.2
12	9.0	9.7	8.4	5.9	4.2	2.4	1.9	2.2	3.2	5.0	7.6	9.1
13	9.2	9.8	8.2	5.7	4.2	2.4	2.2	2.1	3.4	5.1	7.2	9.4
14	9.6	10.1	8.3	5.7	4.2	2.9	1.9	2.0	3.6	5.7	7.7	9.3
15	9.6	9.4	8.3	6.0	4.1	3.0	2.0	2.1	3.5	5.4	7.8	9.3
16	9.8	9.6	8.2	6.1	3.9	2.7	2.1	1.9	3.7	5.4	8.0	9.2
17	9.8	9.6	7.9	6.3	3.9	2.6	1.9	1.8	3.6	5.6	7.9	9.1
18	10.1	9.4	8.2	6.4	4.0	2.6	1.7	1.9	3.5	5.7	8.0	8.9
19	9.9	8.9	8.5	6.6	3.8	2.6	1.6	1.9	3.3	6.0	7.9	9.1
20	10.0	9.0	8.2	6.3	3.4	2.8	1.5	1.8	3.4	6.1	8.0	9.3
21	10.2	9.3	8.0	6.1	3.9	2.8	1.5	1.8	3.9	6.3	8.1	9.2
22	10.1	9.4	7.8	5.7	3.9	2.8	1.4	1.9	3.9	6.1	8.1	9.3
23	10.1	9.3	8.0	5.7	3.9	2.9	1.9	2.1	4.1	6.0	7.9	9.4
24	9.9	8.8	7.7	5.5	3.9	3.0	2.2	2.1	4.2	6.1	7.9	9.3
25	10.1	8.8	7.4	5.3	4.3	3.2	2.2	2.2	4.2	5.9	8.1	9.4
26	10.2	8.9	7.3	5.3	3.9	2.7	2.1	2.2	4.2	6.0	7.8	9.2
27	10.3	8.9	7.4	5.5	3.7	2.2	2.1	2.3	3.9	6.1	8.3	8.9
28	9.9	8.9	7.7	5.3	3.7	2.0	1.7	2.4	3.6	6.3	8.4	8.7
29	9.9		7.7	5.3	3.4	1.7	1.6	2.6	3.8	6.4	8.2	9.0
30	10.1		7.7	5.0	3.2	2.0	1.7	2.4	3.9	6.7	8.6	8.9
31	10.0		7.4		3.3		1.9	2.5		6.8		9.4
MEAN	9.5	9.6	8.2	6.0	4.1	2.7	2.0	2.1	3.4	5.5	7.7	9.0

TABLE 6

MEAN DAILY TEMP. (°C) 3 HOURLY MEANS (1954 - 1963)

	02	05	08	11	14	17	20	23	MEAN
JAN.	6.6	6.9	9.1	10.7	10.6	9.6	7.9	6.9	8.5
FEB.	7.0	6.9	9.4	11.2	11.4	10.1	8.2	7.3	8.9
MAR.	6.6	6.4	8.1	10.1	10.6	9.2	7.3	6.7	8.1
APR.	4.8	4.7	5.3	7.3	7.7	6.1	5.1	4.8	5.7
MAY.	3.4	3.4	3.6	5.1	5.3	4.2	3.7	3.4	4.0
JUNE.	2.2	2.1	2.2	3.2	3.5	2.6	2.3	2.1	2.5
JULY.	1.7	1.6	1.8	2.9	3.3	2.2	1.9	1.8	2.4
AUG.	1.6	1.4	1.7	3.3	3.8	2.5	1.9	1.8	2.3
SEPT.	2.1	2.1	3.2	5.2	5.3	3.9	2.7	2.2	3.3
OCT.	3.4	3.3	5.8	7.9	7.9	6.3	4.2	3.8	5.3
NOV.	4.8	5.2	7.8	9.4	9.3	8.1	5.9	5.1	7.0
DEC.	5.5	6.2	8.5	9.9	9.8	8.7	6.9	5.9	7.7

TABLE 7

RELATIVE HUMIDITY 3 HOURLY AND MONTHLY MEANS (1954 - 1963)

	02	05	08	11	14	17	20	23	M
JAN.	89	88	79	72	72	77	84	87	81
FEB.	89	89	80	71	71	75	83	87	81
MAR.	89	90	85	74	71	76	86	88	82
APR.	90	91	89	80	78	84	89	90	87
MAY.	91	90	90	85	83	88	90	91	88
JUNE.	91	91	90	88	86	89	90	91	89
JULY.	90	90	90	87	86	89	90	90	89
AUG.	90	91	90	82	81	88	89	89	88
SEPT.	90	90	86	78	76	83	87	90	85
OCT.	88	89	79	68	68	75	86	89	80
NOV.	89	87	76	69	69	74	84	88	79
DEC.	89	88	77	72	72	75	83	87	80

TABLE 8

VAPOUR PRESSURE (MILLIBARS) 3 HOURLY AND MONTHLY MEANS 1954 - 1963

	02	05	08	11	14	17	20	23	MEAN
JAN.	8.6	8.7	9.1	9.2	9.1	9.2	8.9	8.6	8.9
FEB.	8.9	8.8	9.4	9.4	9.5	9.2	9.0	8.8	9.1
MAR.	8.7	8.6	9.1	9.1	9.0	8.8	8.7	8.7	8.8
APR.	7.7	7.7	7.9	8.1	8.2	7.9	7.8	7.7	7.9
MAY.	7.1	7.0	7.1	7.4	7.4	7.2	7.1	7.1	7.2
JUNE.	6.5	6.4	6.4	6.8	6.7	6.5	6.5	6.4	6.5
JULY.	6.2	6.1	6.2	6.5	6.6	6.4	6.3	6.2	6.3
AUG.	6.2	6.1	6.2	6.3	6.5	6.4	6.2	6.2	6.3
SEPT.	6.4	6.4	6.6	6.9	6.7	6.7	6.4	6.4	6.6
OCT.	6.8	6.9	7.3	7.2	7.2	7.1	7.1	7.1	7.1
NOV.	7.6	7.7	8.0	8.1	8.1	8.0	7.7	7.7	7.9
DEC.	8.0	8.3	8.5	8.7	8.7	8.4	8.2	8.0	8.4

TABLE 9

MEAN DAILY (0000-2400 GMT) AND TOTAL MONTHLY RAINFALL (MMS) 1954 - 1963.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
JAN.	2.1	2.8	1.9	1.2	3.6	3.5	4.2	1.4	2.8	1.4	2.9	2.4	1.4	2.1	2.1	3.9	1.0	3.4	1.4	1.6	6.0	4.1	2.5	0.5	1.1	3.2	3.1	2.4	2.0	2.5	0.6	75.1
FEB.	0.5	1.1	1.4	1.2	0.6	1.1	0.8	2.0	0.5	4.2	1.0	0.5	1.9	5.5	2.2	1.6	2.3	2.1	1.1	1.5	2.8	0.8	1.6	0.7	3.0	0.7	1.1	1.9	0.2			45.9
MAR.	0.6	1.4	1.2	0.7	0.6	2.2	1.4	1.1	0.9	1.3	0.6	1.7	0.8	3.3	2.0	1.6	0.1	0.3	1.5	0.5	1.6	1.4	1.0	1.9	2.0	2.1	1.1	0.7	0.4	4.3	1.2	41.5
APR.	5.2	0.7	1.3	1.4	1.1	2.0	0.3	1.3	2.2	4.0	2.3	2.4	1.2	0.6	2.0	0.2	0.3	1.3	3.2	0.8	1.2	0.7	1.7	0.8	1.1	1.1	1.8	3.1	2.4	1.4		49.1
MAY	2.9	1.3	1.8	2.9	1.3	2.6	1.7	4.0	1.8	2.2	1.8	1.0	1.2	1.1	1.2	4.5	1.4	0.8	1.2	3.1	2.6	1.4	0.7	0.4	1.1	0.8	1.6	5.2	0.9	0.7	0.9	56.1
JUNE	1.7	3.6	2.3	2.4	1.9	2.3	1.0	1.6	2.2	2.3	1.7	0.4	2.5	2.2	0.6	1.5	2.1	1.1	2.1	0.9	0.8	0.6	1.1	1.5	1.4	1.0	1.9	1.0	1.5	1.0		48.2
JULY	1.1	1.4	1.4	2.5	1.7	3.9	0.8	1.8	1.3	2.2	3.8	1.9	0.5	1.7	1.4	2.1	1.0	1.4	2.6	1.5	2.2	2.9	2.8	0.7	1.3	0.7	0.4	1.0	2.0	1.4	1.2	52.6
AUG.	1.3	1.1	1.8	0.9	0.9	0.4	1.2	1.2	3.2	1.1	1.6	1.9	1.8	1.3	1.5	0.4	0.7	0.2	1.5	0.3	2.4	0.4	0.9	2.6	1.0	2.6	1.0	0.4	1.5	1.3	2.4	40.8
SEPT.	0.9	2.2	0.5	1.2	0.5	0.9	1.9	1.0	0.9	1.1	0.7	0.8	3.2	0.7	1.1	0.7	0.8	1.6	1.6	1.9	0.5	0.8	1.5	1.1	1.3	1.0	0.4	0.3	0.6	0.3		32.0
OCT.	0.1	0.1	1.0	0.5	0.5	1.1	1.2	0.4	0.3	0.8	3.4	1.3	0.4	1.7	0.3	2.8	1.8	0.8	0.4	1.0	0.8	1.6	1.2	0.8	0.3	1.6	0.5	0.3	0.6	0.3	2.8	30.7
NOV.	0.4	0.1	1.2	0.8	1.7	0.8	0.1	0.7	0.6	1.6	1.5	0.7	1.6	0.8	1.6	1.3	1.3	1.0	1.0	2.3	2.6	2.5	1.5	2.4	0.6	1.5	1.3	2.2	0.8	3.1		39.6
DEC.	2.3	2.7	1.5	0.7	1.0	3.3	2.9	3.1	3.2	2.9	2.9	0.9	1.0	4.4	1.1	4.0	1.7	3.6	3.6	2.8	1.3	2.3	1.0	1.7	2.6	1.8	2.8	1.2	1.9	1.3	1.6	69.1

MEAN ANNUAL TOTAL (MMS) 580.7

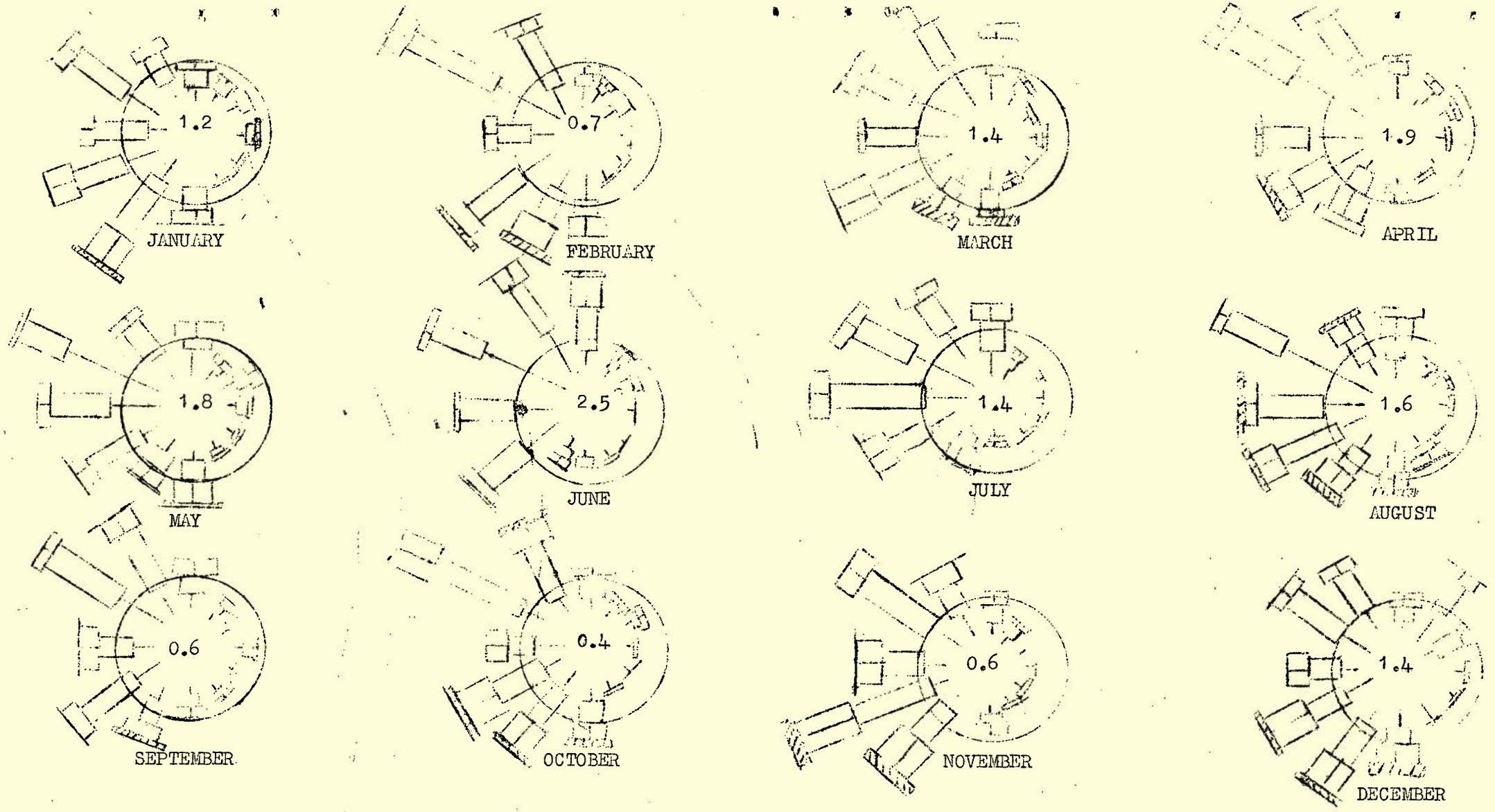
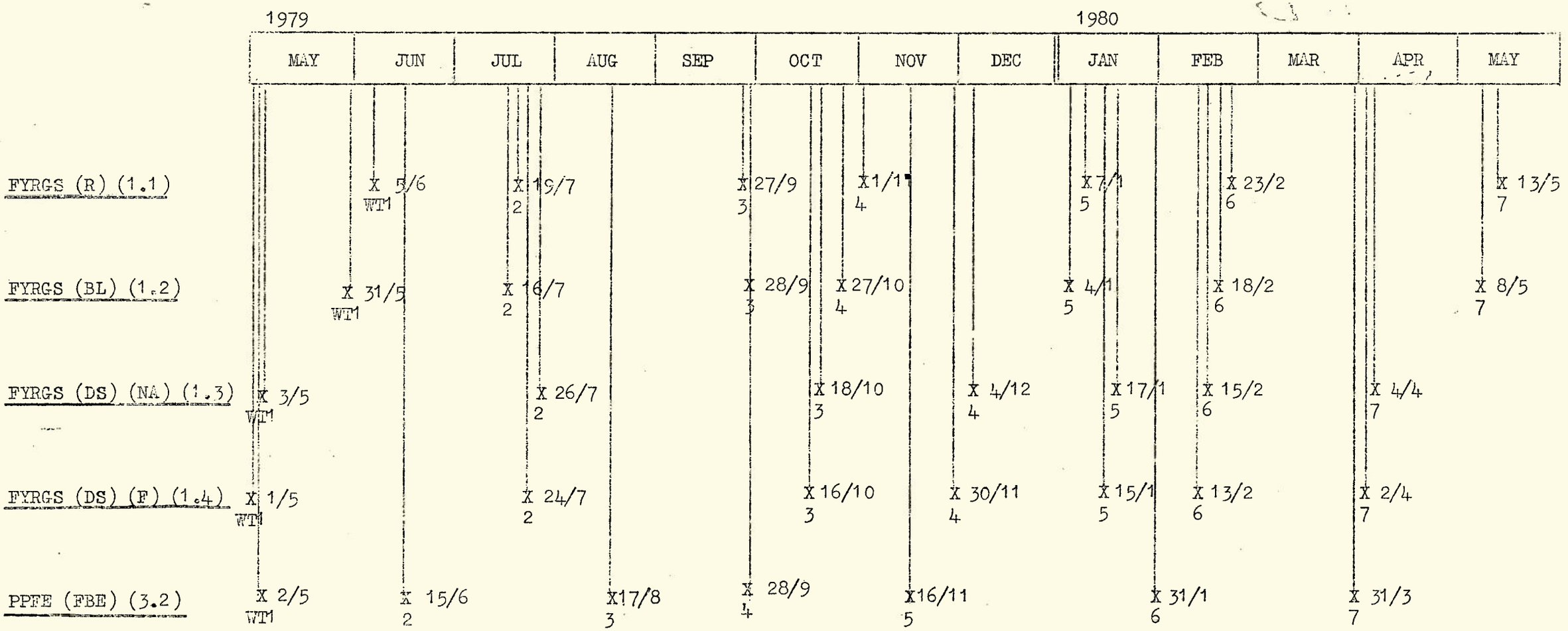


TABLE ††

WIND DIRECTION MONTHLY WIND ROSES (1944 - 1950)

REF: (1.1) (1.2) (1.3) (1.4) (3.2) 79/80

FYRGS & PPFE COMBINED SHCEDULE OF FIELD WORK 1979/80



T.P.M. 6/79

FYRGS & PPFE CALENDAR/DIARY 1979/80

YEAR	MONTH	DATE	DAY NO.		EVENT
1979	MAY	1	1	(DS) (F)	WT1 (MATING)
		2	2	PPFE (FBE)	WT1 MATING
		3	3	(DS) (NA)	WT1 (MATING)
		31	31	FYRGS (BL)	WT1 MATING
	JUNE	5	36	FYRGS (R)	WT1 MATING
		15	46	PPFE (FBE)	WT2 WINTER
	JULY	16	77	FYRGS (BL)	WT2 WINTER
		19	80	FYRGS (R)	WT2 WINTER
		24	85	(DS) (F)	WT2 WINTER
		26	87	(DS) (NA)	WT2 WINTER
	AUGUST	17	109	PPFE (FBE)	WT3 PRE-PARTUM
	SEPTEMBER	27	150	FYRGS (R)	WT3 PRE-PARTUM
		28	151	FYRGS (BL)	WT3 PRE-PARTUM
		"	151	PPFE (FBE)	WT4 PARTURITION
	OCTOBER	16	169	(DS) (F)	WT3 (PARTURITION)
		18	171	(DS) (NA)	WT3 (PARTURITION)
		27	180	FYRGS (BL)	WT4 PARTURITION
	NOVEMBER	1	185	FYRGS (R)	WT4 PARTURITION
		16	200	PPFE (FBE)	WT5 LACTATION
		30	214	(DS) (F)	WT4 SHEARING
	DECEMBER	4	218	(DS) (NA)	WT4 SHEARING
1980	JANUARY	4	249	FYRGS (BL)	WT5 LACTATION/MARKING
		7	252	FYRGS (R)	WT5 LACTATION/MARKING
		15	260	(DS) (F)	WT5 (WEANING)
		17	262	(DS) (NA)	WT5 (WEANING)
		31	276	PPFE (FBE)	WT6 (RECOVERY/SHEARING/MARKING/WEANING)
	FEBRUARY	13	289	(DS) (F)	WT6 SHEARING
		15	291	(DS) (NA)	WT6 SHEARING
		18	294	FYRGS (BL)	WT6 RECOVERY/SHEARING/WEANING
		23	298	FYRGS (R)	WT6 RECOVERY/SHEARING/WEANING
	MARCH	31	335	PPFE (FBE)	WT7 PRE-MATING
	APRIL	2	337	(DS) (F)	WT7 (RECOVERY/PRE-MATING)
		4	339	(DS) (NA)	WT7 (RECOVERY/PRE-MATING)
	MAY	8	8	FYRGS (BL)	WT7 PRE-MATING
		13	13	FYRGS (R)	WT7 PRE-MATING

N.B. DAY 1 IS 1ST MAY

T.P.M. 6/79

CONDITION SCORING

The method to estimate the body fat in live sheep used by GTU and by some Farm staff in the Falklands is that of Jeffries, B. C. (1961) "Body Condition Scoring and its Use in Management". (Tasm. J. Agric. 32, 19-21)

This method was further developed by Russel, Doney and Gunn of HFRO in their paper "Subjective Assessment of Body Fat in Live Sheep" (J. Agric. Sci., Camb, (1969) 72. 451-454) when with Blackface sheep they found a correlation between "score" and percentage chemical fat in the fleece-free empty body.

It is hoped that some work will be done concerning the relationship between live weight, dead weight, condition score and chest depth in the course of other investigations.

1.1 TWO PASTURE EXPERIMENT - SALVADOR (RONDA)

(a) This experiment commenced April 76 to test the production increase obtainable from ewes as a result of subjecting 200 to a management regime similar to that developed by HFRO in UK (the two-pasture system). These sheep (T) are compared with a further 200 which are set stocked (C1). Both flocks are lambed later than the traditional time so their results are subsequently compared with the ewes (C2) on the rest of the original camp (1900). This information comprises mean ewe fleece weights, lamb marking percentage, lamb weaning percentage, a sample of lamb weaning weights, and losses of ewes dipping to shearing. The two flocks of 200 ewes (C, T) each are recorded in detail: weights and condition scores (7) full lamb recording, wool weights and measurement.

(b) Except for season 76/77 when the Control ewes were mated at the wrong time, the work to date has gone smoothly, and the mating date has now been brought back from 6 weeks after the traditional time to nearer 3 weeks (mating 4 June) without a significant drop in lamb birth weights (November 78). Due to the fund of uneaten herbage particularly noticeable in C1 a revision of the vegetation map was made and alterations to boundaries and stock numbers completed in April 79, which will further include the destruction of selected vegetation by rotavating the areas planned for reseeding in December 79 (70 acres Control, 70 acres Treatment).

(c) Summary of Main Conclusions

Over the previous three sheep years, results can be summarised:-

	C_2	C_1	T
Wool (kg greasy)	3.4	4.2	4.8
Birth wt (kg)	3.7	4.1	4.1
Wean wt (kg)	22.1	23.3	23.0
Wean %	58.8%	69.1%	71.5%
Annual ewe loss rate	10.2%	10.2%	10.4%

One notable aspect is the consistently poor performance of the Treatment maiden ewes compared to those of C_1. (See Appendix Tables 1.1).

The later lambing (78/79) has not significantly depressed the birth weights in T.

Lamb growth rates (g/day) averaged.

	B-M		B-W		B-b	
	C	T	C	T	C	T
77/78	217	213	143	139	178	173
78/79	219	237	159	173	194	208

(d) Proposals for Future

There is no dramatic difference between the Control 1 and Treatment sheep; this has been the result obtained on the majority of the flocks of 1.5 Ewe Extension Scheme. It is therefore planned to introduce 70 acres of St 1 Reseed to both Control (C1) and Treatment (T) flocks in order to measure the production increase obtainable as a result of increasing the quantity and quality of available herbage. The 70 acres on the Control side will be available throughout the year, but on the Treatment side the reseed will be confined to the Production Paddock (P) in order that the two-pasture system may be further tested. Rotavation will take place in Sept 79 and sowing December 79 or February 80. Complete recording will be maintained.

1.2 TWO PASTURE EXPERIMENT - BRENTON LOCH (DARWIN)

(a) This experiment, the parallel to 1.1 Salvador, was set up in May 76 to test, in another location, the production increase obtainable from ewes as a result of subjecting 200 to a management regime similar to that developed by HFRO in UK (the two-pasture system). These sheep are compared with another 200 which are set-stocked. Both flocks are lambed later (originally six, now three weeks) than the traditional time so their results are subsequently compared with the ewes (C2) on the rest of the original camp (600). This information comprises mean ewe fleece weights, lamb marking percentage, lamb weaning percentage, a sample of lamb weaning weights and losses of ewes dipping to shearing. The two flocks of 200 ewes (C, T) each are recorded in detail: weights and condition scores (7) full lamb recording, wool weights and measurement.

(b) Due to the inability of keeping rams from the experimental ewes until the correct time, the continuation of this experiment is open to question.

Season 76/77	All ewes mated at incorrect time. Lamb recording abandoned.
Season 77/78	Removal of experimental ewes from resources to avoid rams caused sufficient stress to depress subsequent lambing performance to a disastrous level.
Season 78/79	One half of the C ewes were mated at the incorrect time.
Season 79/80	Some C but apparently <u>all</u> T ewes mated at incorrect time.

An examination of the stocking rates and vegetation values and type indicated that slight stock adjustment was required (+7.5% C1, +2.5% T) with a reduction in planned reseed when applied to C (50 acres C, 70 acres T).

(c) <u>Summary of Main Conclusions</u>

No appreciable difference has been obtained between Control 1 and Treatment and although information concerning the remainder (C2) flock has been difficult to obtain, it appears the performance from both experimental (C and T) flocks is much poorer than that of the C2 flock. (See Appendix Tables 1.2)

Over the previous three years, results can be summarised:-

	C2	C1	T
Wool (kg greasy)	3.5	3.5	3.6
Birth wt (kg)	3.7	4.1	3.8
Wean wt (kg)	22.0	19.8	20.3
Wean %	74.2%	49.3%	52.9%
Annual ewe loss rate	11.5%	9.9%	13.1%

The earlier lambing (78/79) has significantly depressed the birth weights in T.

(d) <u>Proposals for Future</u>

In view of the difficulties detailed above three re-design possibilities were submitted to the Committee June 79, all of which involved re-fencing the perimeter of the experimental area and

(a) continuing as planned (Eadie Report Mar 78, GTU Committtee ODA July 78) but using previous results as valid background.

(b) completing 70 ac RS in P only, using C as contemporary comparison only.

(c) completing 70 ac RS in P only year one further 70 ac RS year two, and running the 400 experimental ewes in a 3-pasture system using previous results as the valid background.

To date no design alterations have been recommended by the Committee.

TWO-PASTURE SYSTEM EXPERIMENTS 1.1, 1.2

Pre-mating live weights and subsequent Lambing Performance

Using data from 1.1, 1.2 from 76 - 78 it was possible to point-graph live weights (kg) at mating against subsequent lambing percentage for maiden ($2\frac{1}{2}$ y.o.), 3 and 5 crop ewes. (graphs below)

"Acceptable" lambing percentages seem to depend upon greater live weights and if minimum weights at mating can be suggested at this stage, then

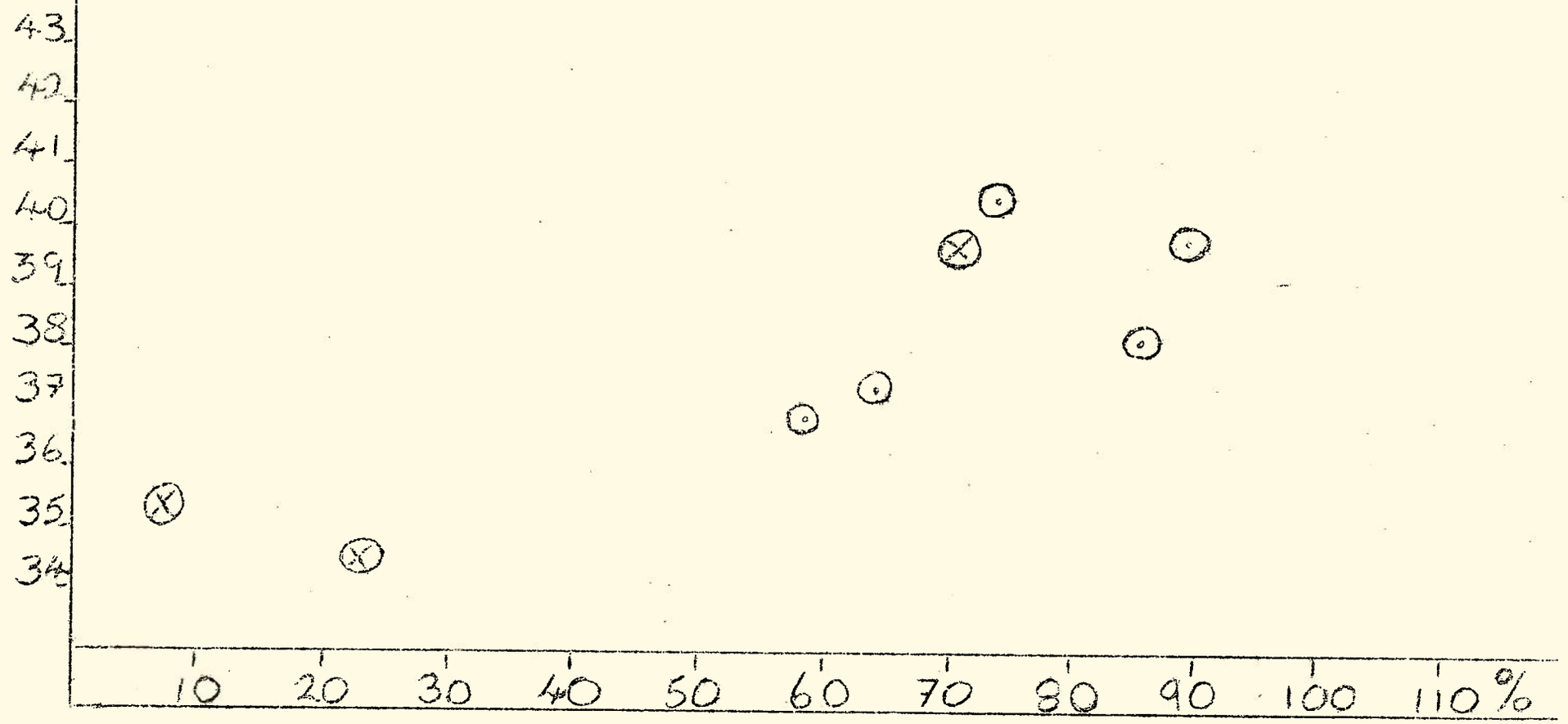
Age at Mating			kg at mating
$2\frac{1}{2}$ y.o.	0 crop	>	38
$5\frac{1}{2}$ y.o.	3 crop	>	41
$7\frac{1}{2}$ y.o.	5 crop	>	42

Continuing weight loss during mating is also considered to affect lambing performance (See Appendix 1.2)

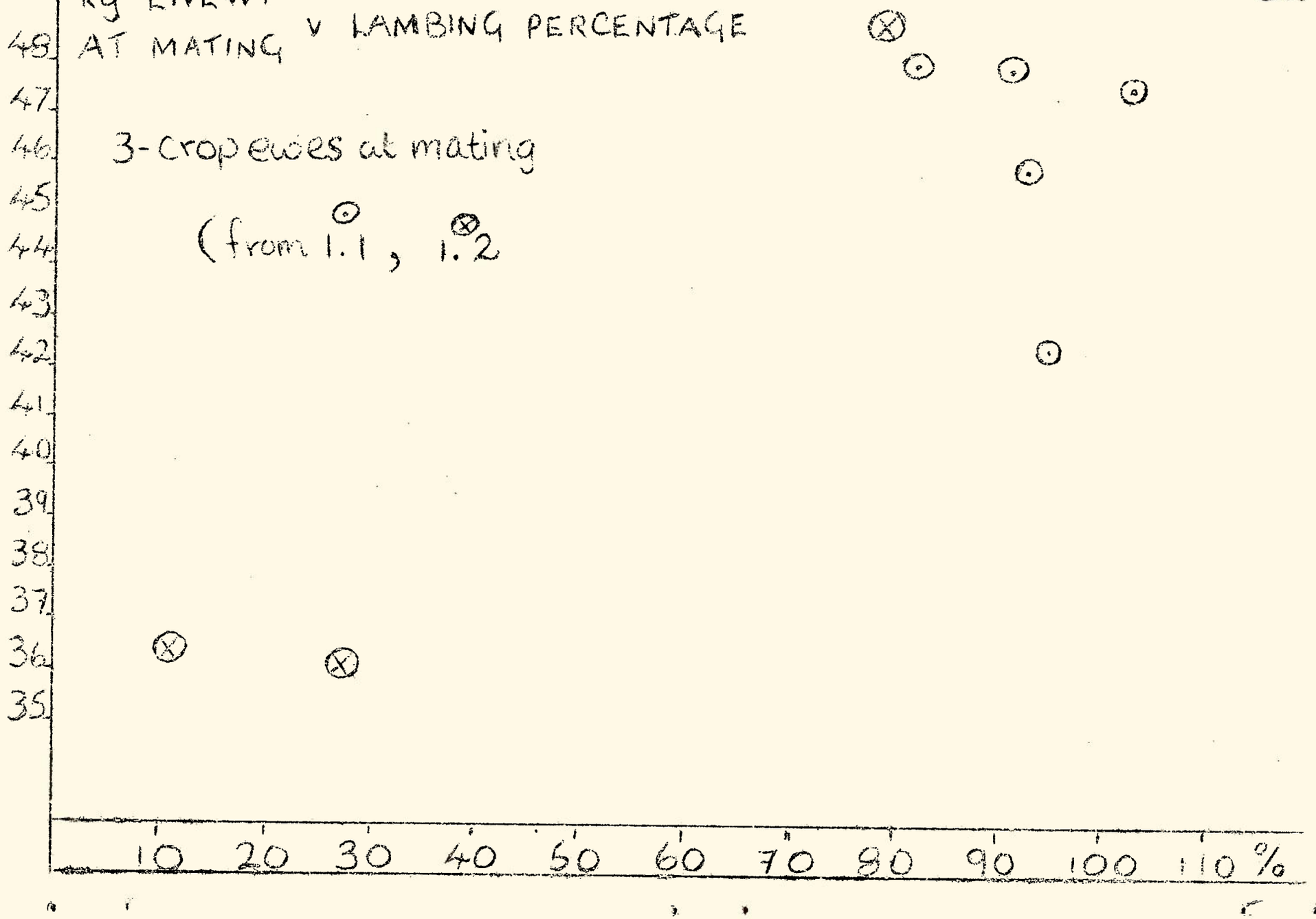
kg LIVEWT AT MATING v LAMBING PERCENTAGE

⊙ - crop(maiden) ewes at mating

(from 1.1, 1.2)



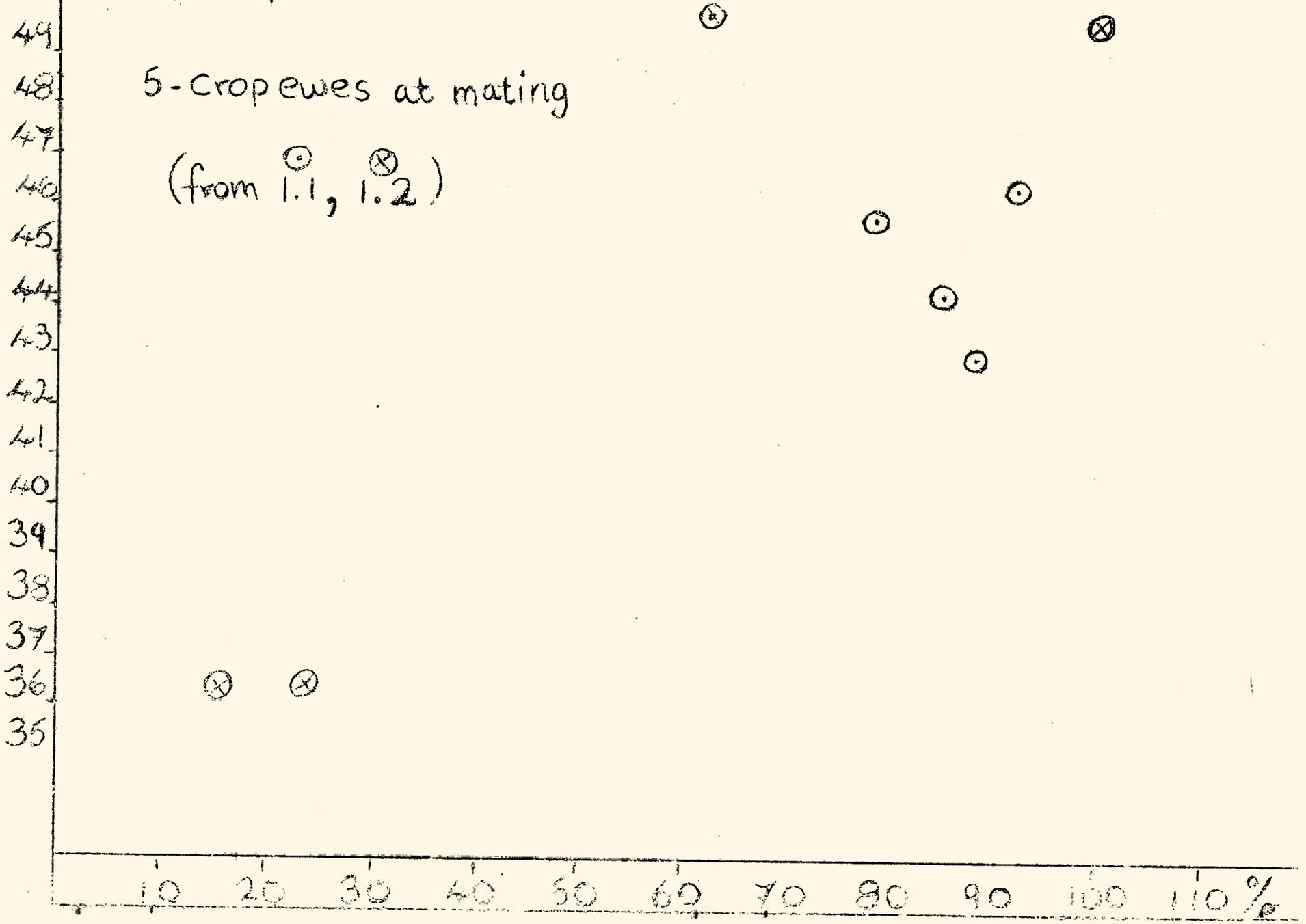
kg LIVEWT AT MATING v LAMBING PERCENTAGE



3-crop ewes at mating

(from 1.1 , 1.2

KG. LIVE WT. AT MATING v LAMBING PERCENTAGE



1.3 DRY SHEEP EXPERIMENT NORTH ARM

This Study, largely observational, involves all classes of stock. Hoggs (50e & 50w), shearlings (50e & 50w) and adults of both sexes (50e & 50w) are stocked on an enclosure and weighed, condition scored and dye-banded seven times per year. Hoggs, shearlings and wethers are shorn in December, and all adult ewes in February.

Work commenced in June 1977 and, due to the inability of extrapolating results obtained from adult wethers since their stocking rate was considered too low by commercial standards (Eadie Report Mar 78) they were contained on a smaller, less favoured area of the paddock from July 79.

Summary of Main Conclusions

The difference in fleece weight (dry ewes v wethers) ranges from 0 (hoggs) to 17% (3 shear) with a mean of 11.5% in favour of wethers (Season 78/79).

The weaning weight of the hogg influences the first fleece weight (taken at 1 y.o.) particularly in wethers (see Appendix 1.3, 1.4).

The rather high loss rates are largely due to sheep wandering.

Proposals for Future

The capability of wool growth in winter will be studied by moving a sample of wethers from the less to the better favoured experimental area for a period. Further sub-division should be completed for the more detailed study of the different classes of stock.

1.4 DRY SHEEP EXPERIMENT FITZROY

This parallel study, with 1.3 North Arm, is also largely observational. All classes of stock, hoggs (50e & 50w), shearlings (50e & 50w) and adults of both sexes (50e & 50w) are stocked on an enclosure and weighed, condition scored and dye-banded seven times per year. Hoggs, shearlings and wethers are shorn in December and the ewes in January.

Work commenced in January 78 and due to the inability of extrapolating results obtained from adult wethers since their stocking rate was considered too low by commercial standards (Eadie Report Mar 78) they were confined to a less favoured area of the original camp from April 79.

Summary of Main Conclusions

The difference in fleece weights (dry ewes v wethers) is greatest in hoggs at only 5% in favour of wethers (season 78/79), there being little difference between the sexes in other ages. As at North Arm, the weaning weight of the hogg affects the first fleece weight (taken at 1 y.o.); at Fitzroy particularly in the ewe hoggs (see Appendix 1.3, 1.4). The high age-group losses in the wethers was due to the breakdown of a sea fence and the calculated loss of 12.4% is thought to be correct.

Proposals for Future

The capability of wool growth in winter will be studied by moving a sample of wethers from the less to the better favoured experimental area for a period. Further subdivision should be done so that the different classes of stock can be more closely studied.

1.5 EWE EXTENSION SCHEME

This Project was initiated season 76/77 in order to test the Two-Pasture System in a variety of locations, normally accompanied by late-lambing (up to 4 weeks later than traditional dates). Ewes occupy the better areas during the pre-partum, lambing, lactation and mating periods only.

Work to Date

The first season (76/77) flocks were used at Teal Inlet, Dunnose Head, Chartres, Hill Cove and K.C. 77/78 increased to nine flocks and 78/79 increased to 13, three of which were as a result of 1.5/2.1 Reseeding Scheme (50 ac blocks). The recording of these flocks is limited by time and labour available on the eight farms involved, but all have available tags, lamb balances, fleece weighers and five now have ewe and lamb weigh crates, enabling detailed information to be collected.

Summary of Main Conclusions

From the Appendix (Section 1.5) it is apparent that of those systems with two or more years' results, the average marking/weaning percentages have risen approximately 9.6%. Although these results are encouraging lack of a dramatic result reinforces the conclusions from 1.1 and 1.2 that the Two-pasture System alone is not capable of increasing weaning percentages sufficiently and that the Two-pasture System in conjunction with better reseeds seems necessary for substantial production increase.

1.6 DRY SHEEP EXTENSION SCHEME

This project was commenced in sheep year 78/79 to gain supplementary information to

a) 1.3, 1.4 Dry Sheep Experiments in order that the results can be extrapolated to the commercial situation with some confidence;

b) 1.7 Systems Design that workable commercial dry sheep systems can be evolved.

The stocking rates at 1.3, 1.4 have now been adjusted (Eadie Report Mar 78, Davies visit 79).

Advice on design and practicalities has been received from A. T. Blake, Manager, North Arm, and R. E. Binnie, Manager, Fitzroy.

Three (3) areas are under study:-

a) North Arm Rotation Scheme (commenced 1975)

b) Leicester etc., Fox Bay West (commenced 1970)

c) Wether Grounds, Port San Carlos (system being prepared)

a) The Rotation Scheme was commenced in 75/76 using three large paddocks. After four years due to increased stocking the individual wool performance is reduced by 11.5% but the total area wool production has increased by 41.5% (78/79). Loss rates have not increased. The planned projected increase (79/80) is 60.5% when the paddocks will number 4 (previously 3). Monitoring and experimental work is planned in the System (see Section 2 and Appendix 2.3).

b) The Scheme at Fox Bay West was commenced by J. R. Robertson in 1969/70. Three paddocks are used, and the stocking rate increase of 51% was achieved on the total area with a very slight drop in individual wool production (2.3%).

It is normal practice at Fox Bay West to draft the wethers into age-groups for shearing and it has been noticeable that those over 4 y.o. performed poorly. A trial (See Appendix 4.2) indicated that sheep over 5 y.o. should be re-dosed by cobalt bullet, and this evidence was supported by Messrs Stephenson and Jefferson (BAS) in 1978 when they found that the geological area of West Falkland on which sheep show a cobalt responsive condition was much larger than indicated on maps accompanying LRD 72 (1969) "Land Systems Analysis of the Falkland Islands" and BAS 76 (1972) "The Geology of the Falkland Islands".

No further stocking rate increase can be achieved until the sheep show a response to additional cobalt treatment to be administered in December 79.

c) At Port San Carlos a great deal of work has been done in the past by concentrating sheep on comparatively small acreages at certain times and some considerable vegetation improvement achieved as a result. Preparations for the formulation of management systems on the ten camps have involved:-

a) notation of air photographs

b) the completion of vegetation maps

at 1:50,000 by the Manager, A. C. Miller and the up-dating of the maps with a view to selecting appropriate camps for shearling wethers and the oldest planned age ($6\frac{1}{2}$ y.o. at start sheep year). The remainder camps will then be allocated to the three main age-groups (2, 3 and 4 shear wethers) in rotation system(s).

It is interesting to note that on this farm there are many more ewes than wethers (1100 and 6,800 respectively). Despite only 4 lamb crops being taken from the ewes the weaning percentages are sufficiently high to provide surplus stock. The limit to increased wool production is therefore the number of dry sheep that can be retained on the farm.

Monitoring of the systems includes:-

a) losses per age-group

b) greasy fleece weights per age-group

c) estimates of the body condition of the sheep

d) simple soil and botanical change measurements (b, c probably by fenceline effect, a, see Section 2, Whitegrass Studies)

e) utilization rate estimates

f) grazing records

g) live weights when possible.

1.7 SYSTEMS DESIGN

The Object is to develop systems for all classes of stock in a range of circumstance which are efficient biologically and economically.

To date all the main large-scale experiments 1.1, 1.2, 1.3 and 1.4 have been designed for specific purposes and modified as a result of the experimental and observational findings. Extensive ewe systems (1.5) were designed as two- or three-pasture systems to provide:-

a) sufficient available dry matter for the ewe throughout the year

b) the highest quality dry matter intake during pre-lambing, lambing and lactation periods, and again during mating (approximately $6\frac{1}{2}$ months of the year).

Extensive wether systems in 1978 were adopted (1.6 a) 10000w and b) 6,800w) as commercially successful systems and are being studied. 1.6 c) at K.C. is still being designed. (9,800w including shearlings)

The object is to increase wool production per unit area, and bring about pasture improvement through increased utilization of the available dry matter (Floate, HFRO 4th Triennial Report).

Commercial systems for ewes would be considered successful when an economic increase in production is achieved compared to production in the past from the same area.

Aims for wether systems are prepared to sacrifice some individual performance by increasing stocking rates in more intensive systems. It is assumed this cannot be done with ewes.

Conclusions: EWES: Results obtained on the two main Two-pasture Experiments 1.1, 1.2 and the Ewe Extension Scheme, 1.5, reveal that only in those systems which have sufficient high quality available dry matter in the production paddocks, and where the lamb losses are low are the most encouraging results achieved (1.5e, h). This has led to the assumption that improved ewe production will depend upon improved nutrition at the critical times by the introduction of high quality reseeds (Davies et al 71, Eadie Report Mar 78, Davies 78, Davies Report 79)*.

ADULT WETHERS: The two successful commercial systems (1.6 a) and b)) are designed in the manner of Feed Budgeting Schemes, are easy to manage and are now well established. Greater utilization rates are achieved with apparent benefit to the available dry matter and without excessive penalty to individual performance. (A. T. BLAKE, 79 "The Improved Management of Native Pasture (Cortaderia pilosa) for Wool Production in Wethers" SOA 1979)

Description of Present Practice

Young sheep: (a) Hoggs

There are a multiplicity of systems being used in late summer for weaned lambs/hoggs and the wintering of hoggs. Losses and subsequent performance seem to be dependent upon three main factors:-

i) the weight of the lamb when weaned

ii) the level of nutrition offered

iii) the physical dangers in the hogg camps (ditches, type of shoreline etc.)

Dipping to shearing hogg losses recorded can be severe: up to 30% is not uncommon. It is not thought that hoggs can be used as vegetation management tools due to their continuous requirement for a relatively high plane of nutrition.

(b) Shearlings

Shearlings of both sexes are normally set-stocked, but losses are never usually severe. Again, it is not thought that this class of stock can be used as a vegetation management tool for the same reasons as that for hoggs.

Systems Design - Young Sheep

Present detailed knowledge is confined to results from 1.3, 1.4 where the level of nutrition is generally good and extrapolation would therefore be dangerous.

It can, however, be said that any proposed system for the young classes of sheep must result in improved year-round nutrition to achieve the level of body weight necessary in 3 shear ewes and wethers entering the adult flocks, that their subsequent performance is not impaired. (See Section 1, Appendix 1 and Appendix 1.5, 3.2)

* Substantial trials using varieties other than Yorkshire Fog in Camp were commenced by S. Miller at Roy Cove in 1968, later by W. R. Luxton at Chartres, and extensive trials with and without fertilizer by B. Hardcastle at Darwin over the past six years. (Grassland Improvement and Related Matters, B. Hardcastle 1979, SOA)

INVESTMENT APPRAISAL ETC.

To develop a system of investment appraisal suitable to the Falkland situation which can be used experimentally and commercially.

Davies, Dickson (Davies et al 71) emphasised the importance of being able to calculate Gross Margins of sheep so that marginal/capital investment calculations could be accomplished.

Theophilus (The Economics of Wool Production in the Falkland Islands 1972) and Williams (Shackleton Report 1976) calculated whole-farm productivity, and examined costs, revenue etc., against unit production (kg greasy wool). But this is of limited use to the commercial farmer managing different flocks of different classes when decisions relating to improved nutrition, more intensive grazing and re-allocation of land require to be taken.

Work commenced with the "Revenue of FI Sheep" (Annual Report 76/77) which calculated the relative contribution of ewes and wethers and suggested a value for weaned lambs. Thereafter it was possible to calculate the Gross Margins of all the classes of stock on an individual and flock basis.

It was further possible to calculate:-

a) a desired production increase in ewes

b) the cost that can be borne by the ewe flock to achieve a desired production increase

c) the necessary increase in flock numbers to break-even on improvement costs

d) an estimate of the required performance and quality of a suitable reseed

e) the probably resultant utilization of the remainder (non reseed) vegetation in a Two-Pasture System

f) the comparative costs of Stage 1 and Yorkshire Fog reseeds.

(See Appendix 1.8 Econ. Appraisal Jan 78, Gross Margins etc. May 78)

A suitable method of Investment Appraisal is an adaptation for FI conditions of that developed by HFRO (HFRO 6th Triennial Report; Maxwell, Eadie, Sibbald) and examples from GTU have been sent to HFRO for testing.

Work is also completed on the calculation of land values and expected remuneration in an area of the Falklands and the methods used (four) are complementary; methods 3 and 4 can be used to value large or small areas of land in some detail. (See Appendix 1.8, Green Patch Study - (a))

Summary: Methods are now available to calculate:-

a) likely Gross Margins for all classes of stock

b) costs both capital and recurrent

c) revenue possible over the range of land and stock classes and types

d) investment appraisal

e) land values

Proposals: All the methods should be refined with greater knowledge of loss rates, expected production of different classes of stock at different ages, etc and the calculations repeated and up-dated.

1.9 DATA HANDLING

This section is relevant to and an integral part of those trials which involve monitoring of individual animal performance. It therefore encompasses the technique of recording, compiling, analysis and presentation of data obtained in the field.

Specifically those investigations involving intensive monitoring of individual animal performance are: the two Two-Pasture System Trials (1.1), (1.2), the two Dry Sheep Investigations (1.3), (1.4), the Pre-Partum Feeding Trial (3.2), and Wool Growth Studies (3.1). In total this involves the recording of over 1500 animals providing a comprehensive individual record of: body weight and body condition score (seven times per annum); fleece weights; dye banded staple for wool growth information; together with breeding success, fate, etc. Where breeding ewes are concerned (approximately 900): the dam is identified together with the date of birth, sex and birth weight of the lamb and subsequent marking and weaning weights of the lamb. Some information has been obtained regarding the subsequent performance of weaned lambs as hoggs, however for practical reasons this has been limited.

The recording system is based on individual sheep entering or (in the case of lambs) born within a trial receiving an identification tag and number. The colour and number format of a tag indicates the age, sex and class of animal and, where appropriate, whether it belongs to a control or treatment group; together with the individual's number within its age group.

As recording frequently takes place in adverse conditions, field record sheets are employed from which data may be transcribed to a permanent record. However the introduction in the 77/78 season of integrated format record sheets has eliminated the need for much tedious transcription; data being immediately available for analysis and extraction of results. Data is stored in annual files relating to the relevant trial and work is in progress in tagging file data chronologically to minimise the risk of loss of vital documents.

To date it has not proved possible to complete a detailed computer analysis of results. It was originally envisaged that this would permit comprehensive statistical analysis, and form a permanent record of the large volume of data forthcoming. The Hill Farming Research Organisation have kindly offered their services and cooperation in the use of their Sheep Record Management programme. However, with no access to a computer terminal in the Falklands, necessitating lengthy preparation of coding forms and subsequent correspondence with UK; the volume of data involved and lack of time has resulted in little progress being achieved.

Consequently much time is therefore spent on the preparation of results by hand, providing immediate review, without however full statistical analysis.

It is hoped that in the forthcoming year, with the advent of additional members of staff and local assistance that more time may be devoted to the completion of coding forms and that this project will be brought up to date.

SECTION 2: AGRONOMY

Proposed Scheme of Agronomy work

2.1 Reseeding Stage One

This covers the establishment and maintenance of 4 x 50 acre blocks and subsequent grass only reseeds i.e. without legumes.

Four blocks of 50 acres have been sown on systems that are part of 1.5 - EWE EXTENSION SCHEME to a mixture of:-

20% - 5lbs	Certified S24 Perennial Ryegrass
20% - 5lbs	Roskilde Late Cocksfoot
20% - 5lbs	Certified S26 Cocksfoot
20% - 5lbs	Dasas Creeping Red Fescue
12% - 3lbs	Arina Dasas Smooth Stalked Meadow Grass
8% - 2lbs	Oregon Highland Bent (Agrostis Tenuis)

(see Appendix 2.1)

These species are expected to have a longer season of growth and be more productive than Yorkshire Fog favoured in the past because of its cheapness and the ease with which it can be established. However the levels of fertilizer which have been applied to these reseeds i.e. 2cwt per acre 12:24:0 and 1cwt per acre Nitrochalk (25% N) (due to go on in the spring) have been based on UK experience and not on experimental work done in the Falklands.

The soil type and weather conditions in the Falklands differ sharply from those in most of UK and present a very special and unusual situation.

The Mean rainfall at Port Stanley (one of the wetter sites in the Falklands) is 580.7mm (492-780mm). Mean wind speed is 16 knots. Summer and winter temperatures (°C) recorded over 22 years at Port Stanley:

	MEAN	MIN	MAX	MEAN MIN	MEAN MAX
JAN	8.5	0	23.9	5.4	12.9
JULY	2.4	-7.8	8.9	0	4.3

(The North coast of Scotland has 1016mm per year rain. Mean daily mid-summer temperature 12.8 °C. Mean daily mid-winter temperature 4.4°C) The vast majority of cultivated soils in Great Britain are mineral soils whereas in the Falklands, Fibric Peats predominate.

By the time the fertilizer is actually on the farm it may cost an additional £80 per ton or even more over UK prices. Depending on fertilizer type and the remoteness of the farm this can mean an on-farm cost of £10 per cwt (50kg). It is therefore most important to work out fertilizer levels appropriate for the Falklands and not just guessed at from work done elsewhere.

Experiments will be done on requirements for a) establishment of desirable species and b) requirements to maintain the sown sward.

To investigate response to nitrogen and phosphorous each of the two nutrients will be applied at three levels, zero, 25 and 50 units per acre. It is important to find out how these nutrients react together, so all combinations of these nutrients at the three levels are under investigation.

	N_0	N_{25}	N_{50}
P_0	N_0P_0	$N_{25}P_0$	$N_{50}P_0$
P_{25}	N_0P_{25}	$N_{25}P_{25}$	$N_{50}P_{25}$
P_{50}	N_0P_{50}	$N_{25}P_{50}$	$N_{50}P_{50}$

These treatments will be randomised and replicated (the lay-out repeated) three times on each site and the experiment will be at four sites; Hope Cottage Rincon (Darwin), Picaso (Teal Inlet), Herbert Stream (Roy Cove) and Goring (Chartres).

Where response to fertilizer is being investigated on an established reseed exclosure cages will be erected over part of each plot to exclude grazing. Where work is being done on new reseeds the success of a Treatment will be measured by estimating percentage cover of each sown species without excluding grazing.

On new reseeds a further factor - neutraliser (lime) - will be investigated again at three levels. In this case the number of treatments per plot becomes 27. The experiment will again be replicated three times on each new reseed. Response to Potash and Sulphur will also be investigated.

At each site upon which there are fertilizer experiments soil samples will be taken for laboratory analyses and weather records (tatter flags, rainfall and soil temperature) will be kept.

It is hoped that the results will enable calibration of the laboratory tests so that from soil samples and weather records specific recommendations can be made for necessary levels of fertilizer for ST 1 Reseeds.

It is hoped to run a Pilot trial at Teal Inlet to find the best sowing time. A small plot will be sown in each month of the year so that the results may be compared.

A simpler trial may also be commenced at Darwin.

2.2 RESEEDING STAGE TWO

This will investigate the introduction of legumes to suitable reseeds.

There are no native plants of the Clover family in the Falklands, but some clovers have managed to grow well, especially at the Airport, around Port Stanley and in some Settlement paddocks.

It is intended to culture in the laboratory and propagate strains of successful root nodule bacteria and use them to innoculate seed to be sown or established seedlings. Other cultures will be imported for trials.

Fertilizer **experiments** similar to those already described will attempt to establish the levels necessary for clover and its attendant bacteria. The species it is **planned to do most work on is white clover (Trifolium repens) but it is hoped to test other species viz.**

Yellow suckling clover
Birds-foot trefoil
Strawberry clover
Caucasian clover
Kenyan clover

Yorkshire clover
Dunsession clover
Strawberry clover
Birdsfoot trefoil
Italian ryegrass clover

Fiona is experimenting slightly to find already during with aiming to establish the most economic for clover mix for the catchment problems. She intends it to be based to be test other mixtures with a typical one mixed.

Fiona is also planning to conduct her research work on in white clover (Trifolium repens) but it to begin with a few preliminary trials to find suitable varieties. Other mixtures will be tried also.

Fiona is also planning to conduct her research work on in white clover (Trifolium repens) but it to begin with a few preliminary trials to find suitable varieties. Other mixtures will be tried also.

(Lotus). Plants (Red Clover), Trefoil Birdsfoot (Bird Deer) and Cocksfoot (Dactylis).

Fiona recommends to Cornwall to be testing increased on an established pasture where clover will be sprayed over part of each plot to enable grazing. Where clover crops will be sprayed over part of each plot to enable grazing. Fiona recommends to Cornwall to be testing increased on an established pasture where clover

On new research a further factor - nematodes (Lime) - will be investigated again at Aber. In this case the number of nematodes per plot between 37. [illegible] will again be plotted from the on each new crowd. Dungmere to [illegible] will also be investigated.

[illegible] a [illegible] to [illegible] will [illegible] and [illegible] will [illegible] to [illegible] [illegible] [illegible] will [illegible] [illegible] [illegible]

2.3 WHITEGRASS STUDIES

a) The Rotation Scheme at North Arm (see 1.6(a) and Appendix 1.6) was commenced in 1975 by the Manager A. T. Blake. A considerable increase in stocking rate has been achieved ($\geq$ 46%) accompanied by apparent pasture improvement.

In order to monitor vegetation change, transects approximately $\frac{3}{4}$ mile in length have been laid out with re-locatable quadrats where vegetation change can be recorded. Records will include -

a) Species present
b) No. whitegrass plants/unit area
c) No. tillers per plant
d) No. leaves/tiller
e) Length of leaves
f) colour of leaves

Annual photographs will be taken. Accurate vegetation maps of the camps in the Rotation will be made.

b) Three small paddocks of one hectare each (2.5 acres) are constructed adjacent to the experimental area. These will be grazed for five days three times per year with 24, 48 and 72 sheep to achieve year-round stocking rates of 1 ha/sheep (2.5 aps), 0.5 ha/sheep (1.2 aps) and 0.28 ha/sheep (0.7 aps).

The changes that occur and the rate of change in these paddocks with known stocking rates will be measured.

c) The Manager of Chartres, W. R. Luxton has achieved favourable vegetation change in wet, poorly drained valleys by 1) running a large open ditch down the valley, 2) running ploughed furrows into the drainage ditch. It seems that lax whitegrass has been altered to bogged whitegrass with attendant smooth-stalked meadow grass (Poa pratensis). Prior to repeating this work in another similar valley the vegetation there has been recorded. Subsequent changes will be described.

2.4 SOILS STUDIES

Members of NP8901 (Royal Marines) have agreed to assist in taking soil samples and have been instructed on the methods. It is intended to conduct a limited soil survey with particular reference to -

a) those areas suitable for improvement

b) the soils overlying the major geological areas.

2.5 VEGETATION MONITORING

The previous Agronomist, J. H. McAdam has drawn attention to the unfavourable spring period. It is necessary to know as precisely as possible the pattern of seasonal growth of the different vegetative communities.

This is achieved by setting up exclosure cages in different locations and measuring the amount of growth which occurs during the different seasons.

2.6 GROSS WEATHER EFFECTS

Full weather records are available for Port Stanley and some information is also available from Darwin, Fox Bay and West Point (see Preface to this Report).

More information is required, especially from the experimental sites, as the climate varies considerably throughout the Country. At the farms where there are sites, soil thermometers, rain gauges and tatter flags have been installed.

2.7 VEGETATION MAPPING (SUPERVISORY)

Vegetation maps will be prepared for the remaining experimental sites and other areas of interest as necessary.

A General Review of the Final Report produced by J.H. McAdam, Pasture Agronomist. 1976-78

(Complete Report can be read at GTU H.Q.)

Climatic Studies

First Jim summarises the weather conditions prevailing during the two seasons he was here.

The winters were both more rainy, less windy, colder and less sunny than average.

1976-77 had a wetter and slightly windier spring with less sun and had a much drier, sunnier, milder autumn.

1977-78 was drier, sunnier and milder than average throughout the growing season.

Tatter Flags

Where the rainfall is similar, we find there is a correlation between rates of tatter of cotton flags and exposure to wind. Under high rainfall conditions the rate of tatter goes up.

Jim had tatter flags in Stanley, at Ronda on Salvador farm and at Brenton Loch on Darwin farm.

The results seem to indicate that those three sites were more exposed and therefore less favourable to plant growth than the Shetland Islands in Northern Britain. Ronda was less exposed than either Stanley or Brenton Loch.

Jim has developed this technique so that we can now use tatter flags as a useful basis for comparative estimates of exposure within the Falkland Islands.

Vegetation Studies

Jim has classified and described the various vegetative communities occurring in the Falkland Islands and as you will know done a lot of mapping of the vegetation which provides information necessary for farm management and planning purposes. He then attempted to assess the mean total annual dry matter produced. There is a high coefficient of variation to his results which means that he is only sure of his figures to within 35% or so.

Coastal Green provides 5,000 kg per ha per annum ±

Valley Green 6,000 kg per ha/annum

Bogged Whitegrass 4,500 kg per ha/annum

Various lax Whitegrass communities 700 - nearly 3,000 kg D.M./annum.

These figures however will only really have any meaning when used in conjunction with information on digestibility and palatability of the various pasture components. We can be confident however that the valley and coastal greens are relatively even <u>more valuable</u> than these figures suggest because the grass on them is kept in a highly digestible state throughout the growing season, whereas Whitegrass in its ungrazed state has a very low digestibility indeed (about 37%).

Unfortunately we are still waiting for analyses of herbage digestibility to be done in U.K. It is hoped that Alastair Grieve, our new biochemist, will be able to do digestibility analyses for us in future in the laboratory at G.T.U.

Studies on the Growth of Whitegrass

A series of linear measurements were carried out on a population of Whitegrass leaves to detect seasonal growth patterns and the nature of die-back from the leaf tip.

There was an observed check to early season growth. Maximum leaf extension occurred early in December. The rate of die-back increases with time leading to a high fund of standing dead matter in the sward during the second part of the season.

Ewe energy demand is at its maximum early in the season. This coincides with a period of low productivity as far as the Whitegrass is concerned, consequently levels of sheep nutrition are critically low at this time.

It is important to discover ways of overcoming this dearth of feed early in the season.

Seasonal Pattern of Production

Jim investigated the seasonal pattern of growth of a sward consisting mainly of Smooth stalked meadow grass, Yorkshire fog and Cocksfoot in Stanley. This was only done during one season but the results show the same pattern of very slow growth in early spring followed by a marked peak in late January.

More work must be done on the pattern of growth of the different vegetative communities but if this check in early season growth is due to lack of rain and high wind speeds (which we think it is) then the valleys where shelter and water are available become very important indeed. If such valleys exist it is important to pay attention to making them safe for sheep by straightening ditches etc. and to make use of them early in the year.

Seasonal Changes Occurring in a Whitegrass Community

Jim did detailed work on the pattern of change occurring over the growing season in a Whitegrass community of the lax type.

He found that Whitegrass puts a lot of its energy into root production which may be one of the reasons why we have such good peat but it is not much help from the sheep's point of view. He found that on average only 23.3% of the total dry matter of the sward was green Whitegrass, 47.7% was dead Whitegrass, and 29% was other components.

(71% Whitegrass - of this 33% green and 67% dead)

The total D.M. production of the Whitegrass was just over one metric tonne per hectare, 900lbs per acre. This is equivalent to the lower reported range for Molinia-Nardus grassland in Upland Britain, (Flying Bent - Moor Mat grass associations) which for those of you who know Britain is the type of upland grassland which looks to the eye like our Whitegrass.

Jim also found that bacterial activity was low compared with most European soils.

Jim concluded that it is important to manage the grazing of Whitegrass in such a way that the dead portion is removed and subsequently to control grazing on the area to keep it short and green.

The initial removal of the dead tips may be by burning, mowing or heavy stocking but it is most important to stock at a rate which is sufficiently heavy to keep the Whitegrass short and green subsequently.

Jim again emphasised the difficulties presented by lack of growth in the spring.

Flail Mowing Experiment

Jim investigated the effects of flail mowing dense stands of diddle dee and tall fern at Whalebone Bay, Cape Pembroke, Stanley Common.

Jim found that diddle dee can be killed out by low cutting with a flail mower. However this operation is slow and expensive and presents difficulties for subsequent reseeding.

Flail mowing of diddle dee with the machine set at its highest cutting height encouraged re-growth of new young shoots. Assuming that grazing sheep can use these new young shoots this treatment can be considered as a means of achieving a small amount of improvement and increased utilization of diddle dee areas.

Tall fern however was not destroyed even by close cutting and Jim concludes that dense tall fern areas are not amenable to improvement by mechanical means.

Re-growth of Whitegrass after burning

Jim studied the effect of burning on Whitegrass itself but not on the other components of the sward. He found that 82% of the total dry matter of the Whitegrass was removed by burning but the ratio of green to dead material was also three times higher in the burned than the non-burned areas.

There was more than 4 times as much green material in the non-burned than in the burned areas. His study area was grazed by sheep so this suggests that sheep were making much better use of the Whitegrass after burning than before. 1½ years after burning there was still less standing green material than before burning. Jim concludes that (provided the burned areas are well utilized by heavy grazing by sheep) burning could be a tool for increasing animal production. Proper utilization after burning is however essential.

Direct Drilling

Jim experimented with direct drilling in a dairy paddock in Stanley and subsequently into a Whitegrass sward in Lafonia. He found the Bettinson drill can be used to successfully renovate old pasture by drilling either seed or fertilizer or a combination of the two.

Competition between the existing sward was severe and suggests that this method may not be very suitable for use in areas where the existing vegetation is growing strongly.

There was a significant response to an application of 125 kg per ha of compound fertilizer 20:15:10 (1 cwt per acre). This resulted in a mean daily increase of 100 day period of 43.5 kg D.M. per ha. i.e. 435 kg over the whole period.

This is a very good response indeed.

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1 cwt of compound fertilizer may cost £10 by the time it gets onto the farm. Whether the response that cwt of fertilizer produces will depend entirely on how well the extra production is utilized. Grass has no standard value. Its value depends on what it is used for.

However this response looks most encouraging and suggests that fertilizers are worth considering as a means of improving productivity.

The handling of fertilizer on the charter vessel and into the warehouse needs to be improved.

Renovation of reverting Yorkshire Fog reseeds by applied fertilizer and lime

Yorkshire fog responded to applied fertilizer and lime in some situations. Oversowing of reverting Yorkshire fog was not successful and other techniques such as direct drilling or re-rotavation and reseeding must be investigated if improved species are to be introduced.

Improved species (such as Cocksfoot and Red Fescue) are capable of much higher production than Yorkshire fog under fertilized and unfertilized conditions. Cocksfoot seems to have encour-:aging potential under Falkland Island conditions.

The effect of direct drilling native Whitegrass pasture using a range of seed and fertilizer treatments. Orqueta Park, Goose Green.

Jim found that the Bettinson 3D drill could be used to direct drill seeds and fertilizer into Whitegrass communities.

The use of the direct drill enables large time savings to be made over conventional seed bed preparations. We think that the best time of year for reseeding may be December and at that time of year it may only be possible to spare one man.

A relatively low rate of seeding can be used if Yorkshire fog is drilled. Not more than 10 kg per hectare is sufficient.

There was a marked response in the percentage possible take achieved when fertilizer was applied. Jim recommends 100 kg per ha ($\frac{3}{4}$ cwt per acre) general purpose grassland fertilizer be applied upon drilling. In species which are capable of spreading a further broadcast application upon establishment may be worthwhile.

The drilled area was selectively grazed and this led to an increase in the utilization of the Whitegrass. This should also help in establishment of the sown species by reducing competition from native vegetation.

The effects of Lime and Phosphate on soils and sown species in the Falkland Islands

Jim investigated reseeding on land covered with Whitegrass, small fern and pigvine. A mixture of red fescue, cocksfoot, timothy and smooth stalked meadow grass established success-:fully yielding up to $4\frac{1}{2}$ metric tonnes D.M. per hectare per annum with inputs of $2\frac{1}{2}$ metric tonnes lime and 100 kg P per ha and 1 cwt per ha 25:0:16.

Jim found a significant response to applied phosphate but over the time of the experiment, there was no measurable response to applied lime. There was however an enhancement of response to phosphate by added lime in the wettest site in the second season.

Jim managed to establish innoculated white clover with applied lime, phosphate potash and very little nitrogen. He found it established successfully and the roots nodulated.

Acknowledgments

Jim was very grateful to everyone for their help and co-operation to him in carrying out these experiments.

He has listed his thanks to the individual people who helped him in each experiment, I shall however here pass on his gratitude for the interest, enthusiasm and practical co-operation given by the managers and staff on many farms in the Islands.

He thanks particularly the Falkland Islands Sheepowners' Association who he says (and I quote) "were most helpful at all times and it is a pleasure to record the assistance given by that forward thinking body in all aspects of the work".

Jim says and again I quote "I would especially like to thank the Managers and their wives for their unfailing hospitality on many, often inconvenient and unforeseen prolonged occasions. The kindness of many of the people of Stanley combined with the hospitality of people in the Camp combined to make my own and my family's stay in the Islands an enjoyable one".

Jim also thanks the Falkland Islands Government for their very real interest and gratefully acknowledges assistance given by members of this Government.

M.R. Burkett August 1979.

Addendum

Two comments by J.A. McAdam on the above summary:

1. Exposure - the results indicated that rates of tatter were comparable to those found in the Shetlands - I would not like to state emphatically that conditions for plant growth were less favourable than the Shetlands. I am still not clear about the wind - moisture interaction and its effect on rate of tatter. The trouble is that there is no published work on grassland output and yield in the Shetlands. The main value of tatter flags is in comparison between Falkland Island sites - be careful of comparing results with British ones.

2. The Direct Drilling trial at Stanley - the results from that are exceptionally high and may indicate a real response or are being confounded by the clover and dung etc. already there from the previous season. I would be careful about using the figures. However they do indicate that there is a lot of potential for fertilizer response <u>provided you are putting it on the right kind of grass</u>.

3.1 WOOL GROWTH

Object: To investigate and record the seasonal pattern of wool growth in various classes of dry sheep and breeding ewes with reference to different systems of management and the apparent plane of nutrition.

Introduction: Wool is the single most important Agricultural product in the Falklands. Information on the output of wool from Falkland Island sheep (predominantly Corriedale type) has, to date, largely been limited to gross greasy fleece weights.

The rate of wool growth in sheep is known to be roughly proportional to the rate of Energy intake (Ryder & Stephenson 1968) and Blaxter (1962) suggested that wool growth is also controlled by light intensity while being virtually independent of environmental temperature. However very little is known regarding the actual propensity of the Corriedale, for wool growth and the relevance of nutritional and climatic factors on seasonal growth patterns in the Falkland situation.

Method: This study was superimposed on the two main Two Pasture System Trials at Salvador and Brenton Loch (1.1 & 1.2), the Two Dry Sheep Investigations at North Arm and Fitzroy (1.3 & 1.4) and on the Pre-Partum Feeding Trial at Fox Bay East (3.2). These Investigations involve over 1500 sheep of different classes which were already under intensive observation. As this study was of a purely observational nature, apart from additional handling of animals, no further variables were introduced to the existing trials.

Chapman and Wheeler (1963) described a technique for fleece growth studies, an adaption of which has been used throughout this study. Using a spring loaded syringe, a weak acqueous solution of Durafur Black (I.C.I.) is applied to the wool fibres at the skin surface, at intervals through the year. Care is taken to ensure that this is repeated on subsequent occasions in exactly the same place (along a 5cm line) in order that, as the wool grows, a series of bands (referred to as dye bands) are recorded on the staple.

At shearing, a sample staple is taken from the area of dyebanding and identified by the animal's own tag number, for subsequent measurement in the laboratory. Measurement consists of the total staple length (unstretched) and length of staple grown between intervals of known length. (See Appendix 3.1)

The study commenced in 77/78 when one third of all the sheep in the Two Pasture System Trials (1.1 & 1.2) and all the sheep involved in the Dry Sheep Investigation at North Arm (1.3) were dyebanded throughout the year.

Following this it was decided to dye-band all the sheep in 1.1 and 1.2 and all those in 1.3 and 1.4 (Dry Sheep Investigation at Fitzroy (1.4) commenced January 1978) together with all sheep in 3.2 during the 78/79 season.

Limitations on Interpretation of Results: Following the preliminary studies of 77/78, the limitations of the technique employed were identified and some modifications made.

It was apparent that unless all sheep in the 1.1 & 1.2 trials were to be dye-banded, the number of variables (e.g. treatment, age, shearing date, breeding success etc.) combined with a high % of discarded staples (faded, bands missing etc.), would result in groups of sheep too small for valid assessment. Consequently all sheep in 1.1, 1.2, 1.3, 1.4 and 3.2 were dye-banded in the 78/79 season.

Depending on the individual shearer and the position of the sample staple on the body, the pile remaining on the sheep after shearing varies considerably. Attempts to minimise this source of error have been made for example, by locating the site of dye-banding on the right hand flank of the sheep where the shearing blows tend to be fairly uniform and close to the skin. nonetheless this remains as a considerable source of error at both ends of the staple i.e. in the periods immediately before and after shearing.

The measurement of complete, unstretched staples takes no account of variations in crimp number between sheep. Consequently period measurements were made on a number of individual fibres, stretched taut, from several sheep. It was found that

comparison of individual fibres and the staples to which they belonged gave close agreement, for a number of sheep of several classes. It was assumed therefore, for the purposes of this investigation, that the mean staple length increase for any group of sheep, in a given period is an accurate representation of actual fibre growth over the same period. Further it was assumed that the site chosen for dye-banding and staple sampling is representative of the overall fleece growth.

It is known that wool fibre diameter is highly variable according to a number of factors (primarily nutrition and breed) both between sheep and within the length of the fibre itself. Consequently specific wool production in any given period is determined by fibre length, fibre diameter and density. This investigation attempted only to study fibre length increase over given periods of time, consequently any assessment of actual wool production must take into account these other variables, and any conclusions drawn must be considered in this context.

Staple samples were carefully selected to eliminate as many variables as possible. Staples which were faded, had bands missing or from sheep not rearing a lamb etc. were discarded. Consequently sample sizes for certain age groups and classes of animal are small.

Results: The results presented are derived from the FYRGS (R) (1.1) Two Pasture System trial and the FYRGS D.S. N.A. (1.3) Dry Sheep Investigation, season 78/79. (See Appendix 3.1 Wool Growth Tables 1A - 7 and Figs 1 - 26). Results are presented as mean % Staple Growth per period for a number of animals, by age group and treatment. As the intervals between dye-bands (corresponding to routine weighings; for body weights and condition scores see Appendix 1.1 and 1.3) are of unequal length no valid conclusions can be drawn from these figures alone. The % daily staple growth (mean for a number of sheep) was derived by dividing the Mean % Staple Growth per period by the length of that period (days), and is a measure of rate of growth.

Conclusions. It is apparent that the pattern of seasonal wool growth differs widely between classes of stock. Lactating ewes display a considerable propensity for rapid wool growth, immediately after shearing which appears to be diminished by later shearing i.e. January v March. This propensity is displayed to a lesser extent by dry ewes and is not apparently evident in wethers.

The pattern is largely similar for all ages and treatments on the Two Pasture System, however the length of Period 4 (Figs 1 - 13) which spans pre-lambing, lambing and early lactation may mask differences at this time. It is known that although much reduced in rate, wool growth continues during periods when other body reserves are being depleted. From existing body weight data (See Appendices 1.1, 1.2, 1.3, 1.4), it would appear that the period of greatest body weight loss coincides with that of lowest wool growth rate. The actual period depends on the class of stock involved. However this can be summarised as the winter moths of May to September. It is to be noted that although most classes display an increase in rate of wool growth coincident with rising live weights i.e. in the spring, this rarely equals the apparent rate immediately following shearing.

The pattern of growth in adult wethers is markedly different from that of either lactating or dry ewes. Wethers reach their apparent maximum rate of wool growth in March or April, having been shorn in December. This coincides with the animals achieving their maximum body condition.

As this study was largely observational, it is not possible to draw hard and fast conclusions from the preliminary results. However, having established basic patterns of growth which will be reinforced by the continuation of the study over a period of a further two years at least, basic trends can be interpreted with due regard to the limitations of the results. It has proved possible to tentatively identify those periods during which nutrition may be a limiting factor to wool growth and for which classes of stock. However more detailed experimentation is called for to identify the nature of the relationship between nutrition and wool growth.

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PERFORMANCE ASSOCIATED WITH NUTRITION 3.2

1. Project

Concerns defining the relationship of animal performance with available nutrition within the commercial context which limits assessment of performance to terms of reproductive efficiency, survival and wool growth.

2. Work to date

Each of these factors is covered by other sections (3.5, 3.4, 3.1) and is confounded by the absence of detailed knowledge concerning the value of available herbage (i.e. the nutritive level of the sheep). Thus the present aim is to build up a background of detail in the course of other investigations to which may be applied at a later date the agronomic data being accumulated. Three seasons work is now complete at Fox Bay East (PPFE) see below and Appendix 3.2.

3. Main conclusions

a) there is a severe lack of basic information about performance from ordinary farm records;

b) the investigations described under Deficiency Diseases (4.2 q.v.) indicate that the pattern of growth from weaning to shearing on several mainland farms is one of no growth but on one small island was from 26kg at weaning to 32kg at shearing (shorn weight).

c) On most farms it is not cobalt which limits the growth rate.

d) Some recorded parameters of sheep reared on different farms with different levels of nutrition.

Lamb Birth Weights

Farm	Camp		
Salvador	Ronda (GTU)	165 lambs from adult ewes	4.2kg
	Ronda (GTU)	152 lambs from "young" ewes	3.8kg
Hill Cove	Crooked Inlet West	44 lambs from mixed age ewes	3.3kg
	Holmsteds	24 lambs from mixed age ewes	3.8kg

Lamb Marking Weights

At Salvador the average growth rate from birth to marking was 22gm/day.

Lamb Weaning Weights

Farm	Camp	Wether	No.	Ewe	No.	Date
Hill Cove	Holmsteds	19.6	56	19.2	45	13.2.79
	West Lagoons	18.2	37	18.1	42	15.2.79
	Crooked Inlet West	20.3	34	19.6	38	16.2.79
North Arm	Horn Hill	19.9	100	18.2	100	11.1.79
Salvador	Limpet Creek	23.6	100	22.5	50	15.2.79
	Ronda			17.9	100	1.2.79
	(mixed)	21.55	62			1.3.78
Port Stephens	(mixed)	19.3	100	18.2	200	1.2.78
Sea Lion Island	-	26.2	120			

Winter/Spring Weights Hoggs

Farm	Sex	Number	Weight (kg)	Date
Pebble Island	wether	100	23.2	22.6.79
Fox Bay East	wether	200	24.5	19.4.78
	wether	50	24.3	8.8.78
Port Stephens	wether	82	21.0	23.6.78
	ewe	166	20.2	23.6.78
Salvador	ewe	24	22.4	5.5.78
	ewe	24	19.8	4.9.78
	wether	29	23.5	4.9.78
	wether	24	20.7	4.9.78

Shorn Body Weight (Hoggs)

Farm	Sex	Number	Weight (kg)	Date
Port Stephens	wether	68	19.2	15.11.78
	ewe	146	18.6	15.11.78
Salvador	wether	24	20.7	4.12.78
	ewe	22	19.5	4.12.78
Sea Lion Island	ewe	114	32.4	3.11.78

Hogg Fleece Weights

Farm	Sex	Weight
Salvador	ewe	1.71
	wether	1.83
Port Stephens	ewe	2.12
	wether	1.93
Pebble Island	wether	2.80
Fox Bay West	ewe	2.10
San Carlos	ewe	2.89
Weddell Island	ewe	3.24
Sea Lion Island	ewe	3.83

Body Weights of Young Ewes at 2 Farms

	Age	Port Stephens	Salvador
Onset of 1st Lambing	3 years	30kg	43kg
At 1st weaning	$3\frac{1}{4}$ years	36kg	42kg
At 2nd weaning	$4\frac{1}{4}$ years	30kg	43kg

4. Proposals for future

Accumulation of further data as the opportunity presents itself within the framework of other investigations.

3.2 PRE-PARTUM FEEDING EXPERIMENT (FOX BAY EAST)

To determine the level of nutrition necessary to influence the birth weight and subsequent performance of lambs, the diet of a small flock of ewes (5 ages) is supplemented with grass cubes commencing 5-6 weeks prior to lambing and their performance is compared to a similar flock in an adjacent paddock whose diet is not supplemented.

Three seasons' work is now completed, and results from the first season when the supplementation consisted of a mixture of crushed oats and wheat proved unsatisfactory. Some difficulty has been experienced in training the ewes to accept the feed.

Complete lamb recording has taken place for three years; live weights of ewes, condition scores and now dye-banding is performed throughout the year.

Although the results had not been subjected to full statistical analysis, during year 2 (77/78) the difference in birth weights was noticeable:

Control 3.3 kg Treatment 3.6 kg

The feeding period ewe body weight change was:

Control +1.2 kg Treatment +4.5 kg

In year 3 (78/79) the difference in birth weights was less noticeable:

Control 3.6 kg Treatment 3.8 kg

The feeding period ewe body weight change was:

Control +3.6 gk Treatment +6.3 kg

Future Proposals: The feedstuff to be used 79/80 is a proprietary sheep concentrate at 12% CP.

PHYSIOLOGY - DESCRIPTIVE 3.3

1. This section is more concerned with descriptive physique than physiology although work on a condition which may be due to abnormal physiology is included.

2. Data on descriptive physique is accumulated in the course of other investgations (Appendix 3.5 (B) and at Pebble) and has shown that maiden ewes (at North Arm) have not quite reached their mature size in chest depth 26cm as to 28cm. Also their killing out percentage (head and kidneys present) is slightly less than in mature animals.

At Pebble Island in 4 year old ewes the chest depth was about 28cm and the killing out percentage was 42% (head and kidneys removed).

3. Abnormal Pigmentation

Hepatic pigmentation:- samples of carcase and abdominal lymph nodes, liver, lung kidney collected at Stanley butchery, where the incidence in sheep from some farms has been as high as 50%, were examined by Mr. A. C. Rowland at the Veterinary Field Station, Roslin. Differential staining indicated that the pigment was lipofuscin although electron microscopy showed a further pigment which might have been melanin.

It is proposed to accumulate further data on this unusual condition.

References: Appendix 3.5(B) Ovulation rate of breeding ewes at North Arm 1978 (Report Code 3.5(2)) - circulated 6/79

(Investigation of reproductive parameters at Pebble Island 1979/80) - in progress.

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INTERPRETATION OF LOSS RATES 3.4

1. Project. By investigation of stock returns, loss rates may be interpreted to reveal areas of specific problems and hence provide evidence for the necessity of more detailed investigation.

2. At this stage, detailed investigations of stock returns are limited to those readily available. In general though, the absence of properly documented stock returns makes detailed interpretations difficult.

3. The Falkland Islands Company has kindly made available their stock figures for the years 1968/69 to 1977/78 from which 10 year averages for each of their farms was compiled. A summary of the performance of the whole Company is given below:-

Breeding Performance

96436 breeding ewes produce and rear to marking 63295 lambs (66%) of which 33109 (52%) are ewe lambs, 27652 (44%) wether lambs, 2327 (4%) ram lambs and 225 (0.4%) are rigs, giving a male to female ratio of 1 : 1.1.

First Year Loss

Of the 63295 lambs marked, a total of 7220 (11%) have died by dipping time, but by shearing the losses have reached a total of 12044 of which 5953 (18%) of ewe lambs, 5356 (19%) of wether lambs and 803 (35%) of ram lambs which were alive at marking have died. This gives the loss from marking to dipping as 9% (4824) and from marking to shearing as 19% (12044).

Flock Losses

Each year 346546 sheep are put out (including lambs) but by dipping 64418 (19%) are absent.

With 11609 sheep being culled and 26223 others being otherwise disposed of, the annual black loss runs at 38272 or 11% of the total put out.

Shearing Performance

255254 sheep are shorn each year giving an overall average yield of 3.59kg per head.

These figures show that for every 100 ewes exposed to the ram only 34 ewe lambs are reared to marking. By shearing only 28 of these remain and, by the time they are themselves exposed to the ram, only 25 are left. Thus it is necessary to mate four ewes to obtain one mature replacement for them and for every 100 ewes exposed to the ram only 54 hoggets born from those ewes are shorn.

If the value of a weaned lamb is £1, it can be seen that a little over £48,000/ year is lost in the form of hoggs which die before shearing.

REPRODUCTION 3.5

1. Project

This project is subdivided into 3 overlapping periods which, in combination, describe reproductive efficiency:-

A. Mating performance and ovulation rate

B. Embryonic and foetal mortality

C. Lambing percentage, lamb birth weights and mortality to weaning.

A. Mating performance and ovulation rate.

Mating performance is recorded yearly at Ronda and Brenton Loch. Unfortunately data from the latter place is uncertain and thus disregarded (in this context). At Ronda (see Appendix 3.5(A)), with mating in June, it has been found that a greater percentage of ewes lamb if they hold to their first service than if they hold to a repeat service.

A study of mating performance is being made at Pebble as part of a greater investigation of reproductive efficiency. Preliminary results indicate the mean percentage of ewes available for mating each day is much higher in the last trimester of an 18 day cycle than in the first two viz. 27% against 8% and 11%.

Ovulation rate, studied at North Arm (see Appendix 3.5(B)).

2. Due to the invasion by 2 rams, 33 out of 196 ewes were later found to be in lamb. Bearing in mind the influence of this catastrophy, the ovulation rate of the 3 age groups combined reached a peak of approximately 120% in late May and thereafter declined. The original GTU onset of mating date, and to some extent the present one, overlapped with the period of increase in incidence of anoestrus.

At Pebble Island the ovulation rate in 39 ewes weighing a mean of 49kg was 100% although these sheep had a much higher body condition than at North Arm.

A study of ovulation rate in maiden ewes is in progress at Goose Green but results may be limited due to the fact that many of the ewes were in lamb prior to the original time of selection.

B. Embryonic and foetal mortality is under study at Pebble Island.

C. Lambing percentage etc.

Investigations by udder examination and ewe identification were carried out by farm staff at Hill Cove, Port Stephens, Pebble Island and Teal Inlet.

In general, about 85% of ewes lamb but 12% of these lambs die before mating. In particular:-

Hill Cove (Appendix 3.5(C)) a mixed flock of ewes having their second and third lambs had a point of lambing pregnancy rate of 82% with a 12% loss before marking. Whereas a flock of maiden ewes had a pregnancy rate of 84% with a 25% lamb loss before marking. Lamb birth weights in two other flocks were 3.3 and 3.8kg respectively with a weaning weight of 19kg with no sex difference.

Port Stephens (Appendix 3.5 (D)). In a group of ewes 44% were unsuccessful in producing and rearing their first lamb and 61% of the same ewes failed to rear the second lamb. 21% were barren on both occasions. Another flock revealed that 15% of the pregnant maiden ewes lost their lambs soon after birth.

Pebble Island. 88% of a mixed age ewe flock lambed but 12% had lost lambs by marking with a slight further loss by weaning. (See Appendix 3.5 (E)).

Teal Inlet. In two flocks approximately 91% of ewes were thought to be in lamb at the start of lambing. There were 30% and 11% losses in the two flocks by weaning time.

3. Proposals for the future

It is proposed to carry out more extensive and detailed recording of ewe flocks using manual palpation and an ultrasonic foetometer with recording of lamb birth weights. This may be followed the next year by use of vasectomised rams to investigate whether or not there is an increased ovulation rate in ewes which are teased.

The reports from Pebble Island and Goose Green will be available for the next annual report.

Appendices listed

3.5 (A)	Mating Performance Salvador 1977, 1978	- Included
3.5 (B)	Ovulation Rate of Breeding Ewes at North Arm 1978	- circulated 6/79
3.5 (C)	Report on the Information collected at Hill Cove 1978/79 Concerning Perinatal Mortality and Lamb Performance	- circulated 3/79
3.5 (D)	Report into an Investigation into Ewe Barrenness and Perinatal Mortality in Lambs Born from Maiden Ewes at Port Stephens 1977/78/79	- circulated 3/79
3.5 (E)	Investigation into Barrenness and Perinatal mortality at Pebble Island 1978/79	- circulated 3/79

BREED IMPROVEMENT 3.6

1. Project (a) to present to the farm managers and others interested in sheep breeding, the basis of a breeding programme based on modern genetic principles applicable to Falkland Island conditions.

(b) to introduce new strains of bovine blood considered suitable for milk and meat production under Falkland Island conditions.

2. Work to date The first paper circulated to all interested people (Appendix 3.6 (A)) gave a brief historical outline of the development of breeding programmes, introduced and described the inter-relationships of the characteristics on which such a programme should be based, and outlined the various practical selection methods available by which genetic changes may be made.

The second paper (Appendix 3.6 (B) - "A Nucleus Breeding Programme for the Falkland Islands Sheep Farms". March 1979) describes the development of a nucleus breeding programme by which a ewe flock of proven genetic merit, replacements for which are provided by ewes recorded as performing best in camp, is used to provide rams for the ewe flocks. The need for a logical breeding scheme for the Falkland Islands sheep industry is discussed. The necessity for such a breeding scheme to be based on measured and recorded commercial traits is stressed and the mechanics of a suggested Nucleus Breeding Programme are outlined.

It is pointed out that the large size of the ewe flocks in the Falkland Islands and the great variety of genetic material contained therein, means that there is no need to import animals from abroad.

A plea is made for more recorded information about the sheep already in the Islands.

A brief description of the New Zealand Group Breeding Scheme is given and a brief comparison with the suggested Nucleus Breeding Programme given.

3. Proposals for future The information provided to the farms is merely an adaptation of details readily available from other parts of the world, especially New Zealand, and described in the farming press. Therefore, whilst any person wishing to discuss further details of a breeding scheme for his farm will be welcomed and assisted as far as possible, the development of such a programme will not be a major consideration in GTU relations with the farms.

Summary of the Bovine Artificial Insemination Programme carried out between January and April 1978

371 straws of bovine semen from bulls of 8 different breeds were purchased from the Milk Marketing Board Export Division on behalf of some of the Falkland Islands sheep farmers. Using Estrumate (I.C.I.) to synchronise oestrus, a total of 134 cows were double inseminated on 10 farms.

35 calves (18 males, 17 females including one set of different sex twins) are known to have been born with the on-farm success rate varying from 0 to 100%. The records on some farms are not complete so precise summation is impossible. In general the quality of the cows put forward for insemination was low and in some cases abysmal so it was expected that there would be few calves born on some of the farms.

It is not proposed to repeat the exercise in the near future.

References:

Appendix 3.6 (A)	Some notes on Factors Concerned in the Formulation of a Breeding Plan for Sheep Flocks	circulated 2/79
Appendix 3.6 (B)	A Nucleus Breeding Programme for Falkland Islands Sheep Farms	circulated 3/79
Appendix 3.6 (C)	(1) Report into the Programme of Artificial Insemination of Cows in the Falkland Islands between January and April 1978	circulated 4/78
Appendix 3.6 (C)	(2) Summary of Progeny of Artificial Insemination Programme	included
Appendix 3.6	Note on Nucleus Breeding Scheme	included

GROSS WEATHER EFFECTS 3.7

Continuous and comprehensive meteorological records are maintained at Port Stanley (see Preface). Further records from other experimental sites are becoming available (see Section 2 Agronomy).

Gross weather effects concerning animal production are not solely dependent upon climate affecting vegetation growth (rate and extent of season). The high wind-speeds accompanied by rain causes severe stock losses at lambing and shearing.

In order to estimate the severity of weather in animal exposure terms, and in order to compare weather data (which is continuously collected) with its actual effect, a vertically cylindrical body containing water and maintained at 39.7°C (103.5°F) is under construction and will be exposed to the weather at the Met Station, Port Stanley. Fifty percent (50%) of the windspeed will be cut down by Yorkshire boarding and the tank will be covered with Fibatex. The heat will be maintained with an immersion heater and the amount of energy used to maintain the temperature of the body will be recorded on a meter and printer.

BIOCHEMICAL PARAMETERS 3.8, 4.3

Project The basis of this project is to determine the values of a variety of biochemical parameters either to describe the "normal" for Falkland Island sheep or to assist in determination, and thus correction, of disease. The volume of information obtainable under the prevailing conditions of investigation is limited due to problems of transportation of samples to the laboratory.

1. Copper

Copper levels in liver and blood samples from Port Stephens and Salvador have been analysed at either Weybridge or Compton and present a general picture of normality with some samples being above normal (see Appendices 4.2 (A) and 4.2 (F)). These levels are against a background of (supposed) "deficient" herbage concentrations and hints at a nice complex problem of Copper - Molybdenum - Iron - Sulphate - Zinc antagonism.

When the herbage analyses have been performed, a clearer picture will be available.

A. Liver Samples at Port Stephens

	Mean ppm dry matter	Sample size
Lamb	210	1
3 y.o. ewes	447	7
7 y.o. wether	1500	1
	Mean ppm wet matter	
Lamb	181	1
3 y.o. wether	301	1
Ewe hogg (1 y.o.)	85	1
Ewe 3 y.o.	341	1
	Mean ppm dry matter	
Wether hoggs (1 y.o.)	512	duplicate samples on 8 sheep

B. Whole Blood Samples

1. At Port Stephens:-

5 wethers - assorted ages	0.95 ug/ml (Oct 1977)
66 aged wethers (see Appendix 4.2 (A))	1.05 $\pm$ 0.16 ug/ml (1978/79)

2. At Salvador

(See Appendix 4.2 (F))

13 ewes 0.6ug/ml $\pm$ 0.2 ug/ml at point of lambing (15.11.79)

2. Cobalt and Vitamin B12

The liver samples analysed for cobalt at Compton gave levels of 10 times normal irrespective of whether or not the wether hoggs (in this case) had received cobalt supplementation. Although the results of further analyses are awaited, these figures will have to be checked.

From Vitamin B12 levels in adult wethers it is concluded that the cobalt bullets do not last 5 years (see Appendix 4.2 (A)).

A. Liver Samples from Port Stephens

Mean of duplicate samples on 4 wether hoggs (1 y.o.) = 1.21 ± 0.15 ppm dry matter. (further results are awaited)

B. Serum Samples from Port Stephens - Vitamin B12

Samples collected in the cobalt investigation in adult wethers (Appendix 4.2 (A)) varied from the arbitrary maximum of 2.5 ng/ml down to 0.1 ng/ml. The condition of Vitamin B12 deficiency was cobalt responsive.

A small variety of samples from younger sheep (3 y.o. ewes and wethers and lambs) were sufficient in Vitamin B12.

3. Selenium

The small number of samples from Port Stephens gave levels within the normal range. Correlation of animal levels with plant levels is required.

In liver samples from Port Stephens from 9 sheep of various ages showed a mean of 0.65 ± 0.25 ppm dry matter.

4. Haematological Analysis of blood samples of ewes at Salvador (see Appendix 4.2 (F)) and wethers at Port Stephens (see Appendix 4.2 (A)) showed that means of the haemoglobin concentration and the packed cell volume were within the "normal" ranges.

Proposals Further investigation is awaiting the analysis of the pasture and soil samples at Compton although it is proposed to monitor the serum copper levels in ewes at Salvador.

References:

Appendix 4.2 (A)	The Investigation of the effect in adult wethers of Supplementation of dietary Cobalt at Port Stephens and Fox Bay West 1978. Report Code 4.2(1)	circulated 4/79
Appendix 4.2 (F)	A report into the investigation of the effects of Cobalt and Selenium supplementation in breeding ewes at Salvador during the season 1977/78	circulated 4/79

DISEASE CONTROL - ALL ANIMALS 4.1

1. Brucella Ovis The report of the investigation programme is given in Appendix 4.1 (A) and shows that the incidence of this disease is widespread but at a relatively low level (3.6% of rams infected).

It is hoped that the Sheep Owners' Association will sanction an eradication programme. GTU assistance in sample analysis, organisation and training of lay staff will be given should the programme be launched.

2. Hydatidosis The Government organised hydatid eradication programme has progressed since the introduction of 6-weekly treatment of all dogs with praziquantel (Droncit : BAYER) with the appearance of a general diminution in the incidence of cysts. Due to pressure of other work only 419 sets of offal have been examined between 25.10.77 and 8.6.79. The incidence of viable cysts (12%) is somewhat misleading because the farms were specially chosen because of the age of the sheep involved. However, this high incidence does emphasise the need to maintain the utmost vigilance - a point which has been repeatedly made in the broadcast periodical "Hydatid News" intermittently published with articles to try to maintain interest and awareness of the problems of eradication.

Whilst recommended alterations to the existing law are still awaited, the Falkland Islands eradication programme has been mentioned in an international publication: Gemmell M. A., (1978) Veterinary Medical Review No. 1 pp 3-48.

It is proposed to increase offal examination recording and to examine offal at one or more of the "mass killings" in the autumn.

3. Corynebacterium Ovis infection continues to be prevalent on some farms especially these on which fewer hygenic precautions are taken.

4. Keds reappeared amongst sheep on two farms but fortunately with limited spread. The eradication of this parasite should be complete by 1987 if the mountains of East Falkland are thoroughly gathered.

References:

Appendix 4.1 (A) Report into the Investigation Programme 1977/78 and Recommendations for the Control and Eradication of Brucella Ovis Infection in Falkland Island Rams. Circulated 5/78

DEFICIENCY DISEASE 4.2

1. The study of deficiency diseases has been divided into three parts - Intake, Animal Response, Levels in Animal Tissues.

2. Intake

(a) This part of the project is to determine the concentration of micro- and macro-elements in soils (peats) and pastures and hence deduce the likely intake levels.

(b) So far two major sampling sorties have been made. The first, in the Fitzroy area, had the benefit of the presence of Mr. M. J. Vagg who has the task of the pasture analyses and with whom a comprehensive recording system was devised to detail topographical and geological features. The preliminary report of the analyses so far received is shown in Appendix 4.2 (G). The second survey was in the Fox Bay and Port Stephens areas and results of the analyses are awaited.

It is hoped that the soils samples will be abalysed at Imperial College, but this has yet to be confirmed.

(c) The results so far available, in combination with sample levels obtained by previous workers (T. H. Davies, C. D. Young), indicate that the dominant species, Cortaderia pilosa, is "deficient" in many micro-elements, and that the level of this deficiency may vary from one geological area to another. However, many of these "deficiencies" would be corrected by the sheep grazing shrub plants in the native mixed sward. It would appear that the copper, molybdenum, iron complex will present interpretational problems.

(d) Pending the outstanding analyses, efforts will be made to determine the plant species that sheep do eat. Further sampling is required from the North of East Falkland (Port Stanley Beds) and from Lafonia (Lafonian Sandstones).

3. Animal Response

(a) In the absence of detailed knowledge of intake levels of micro-elements, a variety of trials were instigated to determine if there was any measurable production response due to supplementation.

(b) These trials have all concluded and are detailed in Appendices 4.2 (B), (C), (D), (E), (F), (A).

(c) The sheep grazed on the land of South of West Falkland (Port Stephens Beds of the Lower Devonian Period) respond to cobalt supplementation in terms of decreased loss rate, improved growth rate (in hoggs) and improved wool production (yield). This response was not shown in other areas. The cobalt bullets commonly administered (Permaco-S, T.V.L.) have lost their efficacy after 5 years.

(d) No further trials are planned in the immediate future until intake levels are better known. However, it is hoped to follow the animals used in these trials through their lifetime to obtain basic background data.

3. Levels in Animal Tissues

Details are given under BIOCHEMICAL PARAMETERS (3.8, 4.3) but in general show that, although sheep may be grazing pasture which contains below "normal" levels of copper, the serum and liver concentrations are average to high.

Analytical and logistical problems limit the number and type of samples which may be successfully taken.

References:

Appendix 4.2 (A)	The Investigation of the effects in adult wethers of supplementation of dietary Cobalt at Port Stephens and Fox Bay West 1978	circulated 4/79
Appendix 4.2 (B)	The investigations of the effects of supplementation of dietary Cobalt in ewe hoggs on a variety of different farms	circulated 4/79
Appendix 4.2 (C)	The investigations of the effects of supplementation of dietary Cobalt in wether hoggs on four Falkland Island farms	circulated 4/79
Appendix 4.2 (D)	A comparative trial at Fox Bay East into the effects of administration of Cobalt, Selenium and Multi-element tablest to wether hoggs	circulated 4/79
Appendix 4.2 (E)	A report of the investigation at Port Stephens during the period 1977 to 1979 into the effects of administration of a cobalt bullet (Permaco-S, T.V.L.) to maiden ewes prior to their first lambing in terms of success in rearing lambs over two seasons and wool production	circulated 4/79
Appendix 4.2 (F)	A report into the investigation of the effects of Cobalt and Selenium supplementation in breeding ewes at Salvador during the season 1977/78	circulated 4/79
Appendix 4.2 (G)	Preliminary report on analysis of grass samples taken at Fitzroy (October 1978) and Port Stephens (October 1977)	included

ENDOPARASITISM 4.4

1. To monitor the worm-egg output by the ewes at Ronda and Brenton Loch: To identify whether or not there is a worm problem on any particular farm should the management think there might be and, if so, to advise on control methods.
(Hydatidosis is discussed under Disease Control 4.1)

2. (a) Samples taken from ewes at Brenton Loch and Ronda have all had very low worm egg counts.

(b) At Salvador clinical evidence indicates a helminth problem in the young sheep. However, due to the nature of sheep management in the Falklands selective treatment with comparison of performance (survival, body and fleece weights) is of little value (see Appendix 4.4 (A)). Therefore, assessment of benefit from treatment may only be obtained from the flock situation and analysis of yearly returns.

On this basis the entire lamb populations of Salvador and Pebble Island have been treated with either Panacur (Hoechst) or Thibenzole (Merke, Sharp, Dohme) at weaning and during the winter when moved from one camp to another. Interest is also being taken in the treatment of lambs and hoggs at Port Stephens and Carcass Island.

The slaughter of lambs, hoggs and shearlings at Pebble and Salvador has been used to identifiy worm burdens and worm species present (see below). Species of Ostertagia are probably the most likely to cause problems in hoggs although they may act in conjunction with Nematodirus filicolis to cause scours in lambs.

Worm burdens and Worm types in Salughtered animals

Lambs: at weaning 22.2.79 (Pebble Island)

Sample No.	Abomasum	Small Intestine	
		Nematodirus filicolis	Ostertagia sp
1	2300	-	-
2	800	1800	300
3	900	-	100
4	600	-	100
5	900	3900	-
6	1000	-	1200

In all samples Monezia Expansa was present

Hoggs: at shearing (i.e. 1 year old)

Farm	Date	Sample No.	Abomasum		Small Intestine	
			Trich axei	Ostertagia sp	Trich sp	Ostertagia sp
Pebble Island	11.78	1	-	1800	-	1800
		2	-	11700	-	5800
		3	-	900	-	100
		4	-	1100	-	900
Salvador	10.12.78	1	0	300	0	150
		2	400	12000	700	800
		3	0	500	0	200
		4	0	200	200	2900

Shearlings: at shearing (i.e. 2 years old)

Farm	Date	Sample No.	Abomasum		Small Intestine	
			Trich axei	Ostertagia sp	Trich sp	Ostertagia sp
Salvador	13.12.78	1	100	0	100	300
		2	0	4200	-	1600
		3	100	2700	100	-
		4	0	100	0	0

SECTION 5: LABORATORY STUDIES

Results of previous work appear throughout this report.

Proposals

Disease Control 5.1

The main aspect in this field will be the Brucella Ovis eradication scheme. The SOA is very keen to eradicate this disease and so all rams (approximately 10,000) are to be sampled and tested during the forthcoming summer (1979/80).

It is intended to change the method of testing from the Immuno-diffusion test used in the 1977/78 survey, to the Complement Fixation Test. A visit has been made by A. S. Grieve to the Centro Pan-Americano de Zoonosis in Buenos Aires to arrange a supply of antigen.

During the forthcoming season it is also proposed to monitor, where possible, the worm burdens in sheep, especially lambs.

Investigation into the level of infection of Hydatidosis and Corynebacterium Ovis will be continued.

A routine Diagnostic service will also be available to farmers.

Feed Evaluation 5.2

"In vitro" digestibility studies will be carried out on pasture samples using the West of Scotland College of Agriculture method as modified by HFRO.

It is not expected to begin this work until later this year as several items of equipment had to be ordered from U.K. and are not expected to arrive for some time.

Further studies of pasture fibre content will be carried out using the Van Soest technique. Kjeldahl equipment will also be used for Nitrogen estimations.

Microbiology 5.3

Cultures of Nitrogen fixing bacteria have been obtained from Rothamstead Experimental Station. It is also hoped to isolate these organisms from local pastures. The bacteria will be used to innoculate seeds prior to sowing and possibly also already established pastures.

Other soil bacteria will be studied.

Soils Studies 5.4

Routine soil testing will be carried out with estimations of pH, Lime requirement, Phosphate, Potash and Nitrogen.

At the moment all can be carried out except the Nitrogen estimations which are awaiting the arrival of the Kjeldahl equipment.

6. GOOSE STUDY

6.1 Ground Counts

Aim: to describe the seasonal changes in the density of geese on natural and improved pastures in an 10km radius of Darwin.

Work to date: Monthly counts from February 1978 to March 1979.

Main conclusions: Largest densities of geese occur on greens. Numbers on pond greens were highest in summer and decreased to lowest levels in late winter. Numbers on Poa greens were relatively constant. Very low densities occurred on Whitegrass though there was a peak in winter. Yorkshire fog reseeds were used mainly in winter, though also in summer if used by a shedding flock. Numbers at Darwin dairy, where improved pastures of different types are found, were high from May to September.

Proposals for future: Counts will continue for the period of October 1979 to February 1980. More detailed analyses will be carried out on the data.

6.2 Aerial Transects

Aim: to describe the seasonal changes in the density of geese and sheep over extensive areas of the Falklands.

Work to date: Transects have been flown in February 1978 and June 1978.

Summary of main conclusions: These initial flights indicate that on valley greens sheep are ten times more abundant than geese. Greens on off-shore islands carry similar densities of sheep and geese.

Proposals for future: It is proposed to fly the two main transects in late October 1979, February, April and July 1980. Extensive transects will be planned during 1980.

6.3 Breeding Biology

Aim: to describe aspects of the Upland Goose's breeding biology.

Work to date: Breeding birds were studied during the 1977-78 and 1978-79 breeding seasons.

Summary of main conclusions: Breeding pairs tend to breed with the same mate and in the same place in successive seasons. The average date for onset of incubation was 13th October.. Replacement clutches are rare. Many clutches and broods are lost so that the annual production of young per adult pair was 1.8. Young birds remain with their parents after fledging and become independent at about 8 months old. Females can breed for the first time in their second year. The survival rate for breeding adults was 89% per annum.

Proposals for future: This study will be largely completed after the 1979-80 season. Estimations of survival rate will continue until the 1980-81 season.

6.4 Social Organisation

Aim: to describe the social organisation in the Upland Goose, including their dispersion. This heading includes aspects of breeding dealt with in 6.3.

Work to date: Information on dispersion and dispersal of individually marked birds has been obtained during November 1977 to April 1979. Group sizes have been recorded during ground counts (6.1).

Summary of main conclusions: During summer (mainly December) non-breeders and failed breeders gather at ponds or on the coast to moult their wing feathers. Subsequent movements of these birds showed that birds older than 1 year rarely travelled more than 10km. First year birds also remained within a short distance of their place of marking, though a small percentage did move long distances. The most common group size was two (a pair). Larger groups were either family groups or groups of non-breeders. The latter were more common on large Poa greens or reseeds. Pairs could be either breeders or non-breeders.

Proposals for future: This section of work will continue from September 1979 to March 1980. Thereafter casual observations will be made.

6.5 Intake Studies

Aim: to measure the amount of grass eaten by a goose per day, in summer and winter. To describe the diet on different pastures. To measure total grass eaten by the goose population from different pastures.

Work to date: Information on daily out-put of droppings has been obtained for winter and summer. Digestive efficiency measurements are required to convert this to grass eaten. Diet has been described for 10 birds. Information on the diurnal pattern of grazing and use of pastures has been obtained so that estimates of the total grass eaten by the population can be determined.

Proposals for future work: Measurements of digestive efficiency will be carried out. The diet will be described from more birds. Information on grazing pattern has to be described for winter.

SECTOR
A ARMARIO
B ESTANTERIA
C FICHERO
D ESTANTE
E CARPETA
F BIBLIORATO
G CAJA/ON
H
I ALFABETICO
J EJEMPLAR
OBSERV. C43/1

Report of the Grasslands Trials Unit 1975 - 79

FALKLAND ISLANDS

APPENDIX 3

3.1 WOOL GROWTH

Object: To investigate and record the seasonal pattern of wool growth in various classes of dry sheep and breeding ewes with reference to different systems of management and the apparent plane of nutrition.

Introduction: Wool is the single most important Agricultural product in the Falklands. Information on the output of wool from Falkland Island sheep (predominantly Corriedale type) has, to date, largely been limited to gross greasy fleece weights.

The rate of wool growth in sheep is known to be roughly proportional to the rate of Energy intake (Ryder & Stephenson 1968) and Blaxter (1962) suggested that wool growth is also controlled by light intensity while being virtually independent of environmental temperature. However very little is known regarding the actual propensity of the Corriedale, for wool growth and the relevance of nutritional and climatic factors on seasonal growth patterns in the Falkland situation.

Method: This study was superimposed on the two main Two Pasture System Trials at Salvador and Brenton Loch (1.1 & 1.2), the Two Dry Sheep Investigations at North Arm and Fitzroy (1.3 & 1.4) and on the Pre-Partum Feeding Trial at Fox Bay East (3.2). These Investigations involve over 1500 sheep of different classes which were already under intensive observation. As this study was of a purely observational nature, apart from additional handling of animals, no further variables were introduced to the existing trials.

Chapman and Wheeler (1963) described a technique for fleece growth studies, an adaption of which has been used throughout this study. Using a spring loaded syringe, a weak acqueous solution of Durafur Black (I.C.I.) is applied to the wool fibres at the skin surface, at intervals through the year. Care is taken to ensure that this is repeated on subsequent occasions in exactly the same place (along a 5cm line) in order that, as the wool grows, a series of bands (referred to as dye bands) are recorded on the staple.

At shearing, a sample staple is taken from the area of dyebanding and identified by the animal's own tag number, for subsequent measurement in the laboratory. Measurement consists of the total staple length (unstretched) and length of staple grown between intervals of known length. (See Appendix 3.1)

The study commenced in 77/78 when one third of all the sheep in the Two Pasture System Trials (1.1 & 1.2) and all the sheep involved in the Dry Sheep Investigation at North Arm (1.3) were dyebanded throughout the year.

Following this it was decided to dye-band all the sheep in 1.1 and 1.2 and all those in 1.3 and 1.4 (Dry Sheep Investigation at Fitzroy (1.4) commenced January 1978) together with all sheep in 3.2 during the 78/79 season.

Limitations on Interpretation of Results: Following the preliminary studies of 77/78, the limitations of the technique employed were identified and some modifications made.

It was apparent that unless all sheep in the 1.1 & 1.2 trials were to be dye-banded, the number of variables (e.g. treatment, age, shearing date, breeding success etc.) combined with a high % of discarded staples (faded, bands missing etc.), would result in groups of sheep too small for valid assessment. Consequently all sheep in 1.1, 1.2, 1.3, 1.4 and 3.2 were dye-banded in the 78/79 season.

Depending on the individual shearer and the position of the sample staple on the body, the pile remaining on the sheep after shearing varies considerably. Attempts to minimise this source of error have been made, for example, by locating the site of dye-banding on the right hand flank of the sheep where the shearing blows tend to be fairly uniform and close to the skin. nonetheless this remains as a considerable source of error at both ends of the staple i.e. in the periods immediately before and after shearing.

The measurement of complete, unstretched staples takes no account of variations in crimp number between sheep. Consequently period measurements were made on a number of individual fibres, stretched taut, from several sheep. It was found that

comparison of individual fibres and the staples to which they belonged gave close agreement, for a number of sheep of several classes. It was assumed therefore, for the purposes of this investigation, that the mean staple length increase for any group of sheep, in a given period is an accurate representation of actual fibre growth over the same period. Further it was assumed that the site chosen for dye-banding and staple sampling is representative of the overall fleece growth.

It is known that wool fibre diameter is highly variable according to a number of factors (primarily nutrition and breed) both between sheep and within the length of the fibre itself. Consequently specific wool production in any given period is determined by fibre length, fibre diameter and density. This investigation attempted only to study fibre length increase over given periods of time, consequently any assessment of actual wool production must take into account these other variables, and any conclusions drawn must be considered in this context.

Staple samples were carefully selected to eliminate as many variables as possible. Staples which were faded, had bands missing or from sheep not rearing a lamb etc. were discarded. Consequently sample sizes for certain age groups and classes of animal are small.

Results: The results presented are derived from the FYRGS (R) (1.1) Two Pasture System trial and the FYRGS U.S. N.A. (1.3) Dry Sheep Investigation, season 78/79. (See Appendix 3.1 Wool Growth Tables 1A - 7 and Figs 1 - 26). Results are presented as mean % Staple Growth per period for a number of animals, by age group and treatment. As the intervals between dye-bands (corresponding to routine weighings; for body weights and condition scores see Appendix 1.1 and 1.3) are of unequal length no valid conclusions can be drawn from these figures alone. The % daily staple growth (mean for a number of sheep) was derived by dividing the Mean % Staple Growth per period by the length of that period (days), and is a measure of rate of growth.

Conclusions: It is apparent that the pattern of seasonal wool growth differs widely between classes of stock. Lactating ewes display a considerable propensity for rapid wool growth, immediately after shearing which appears to be diminished by later shearing i.e. January v March. This propensity is displayed to a lesser extent by dry ewes and is not apparently evident in wethers.

The pattern is largely similar for all ages and treatments on the Two Pasture System, however the length of Period 4 (Figs 1 - 13) which spans pre-lambing, lambing and early lactation may mask differences at this time. It is known that although much reduced in rate, wool growth continues during periods when other body reserves are being depleted. From existing body weight data (See Appendices 1.1, 1.2, 1.3, 1.4), it would appear that the period of greatest body weight loss coincides with that of lowest wool growth rate. The actual period depends on the class of stock involved. However this can be summarised as the winter moths of May to September. It is to be noted that although most classes display an increase in rate of wool growth coincident with rising live weights i.e. in the spring, this rarely equals the apparent rate immediately following shearing.

The pattern of growth in adult wethers is markedly different from that of either lactating or dry ewes. Wethers reach their apparent maximum rate of wool growth in March or April, having been shorn in December. This coincides with the animals achieving their maximum body condition.

As this study was largely observational, it is not possible to draw hard and fast conclusions from the preliminary results. However, having established basic patterns of growth which will be reinforced by the continuation of the study over a period of a further two years at least, basic trends can be interpreted with due regard to the limitations of the results. It has proved possible to tentatively identify those periods during which nutrition may be a limiting factor to wool growth and for which classes of stock. However more detailed experimentation is called for to identify the nature of the relationship between nutrition and wool growth.

References:

Blaxter, K. L. (1962). The Energy Metabolism of Ruminants. Hutchinson, London

Ryder, M. L. and Stephenson, S. K. (1968). Wool Growth. Academic Press, London and New York.

Chapman, R. E. and Wheeler, J. L. (1963). Dye-banding, a technique for fleece growth studies. AUST. J. Sci. 26, 53-54

APPENDIX 3.1 WOOL GROWTH

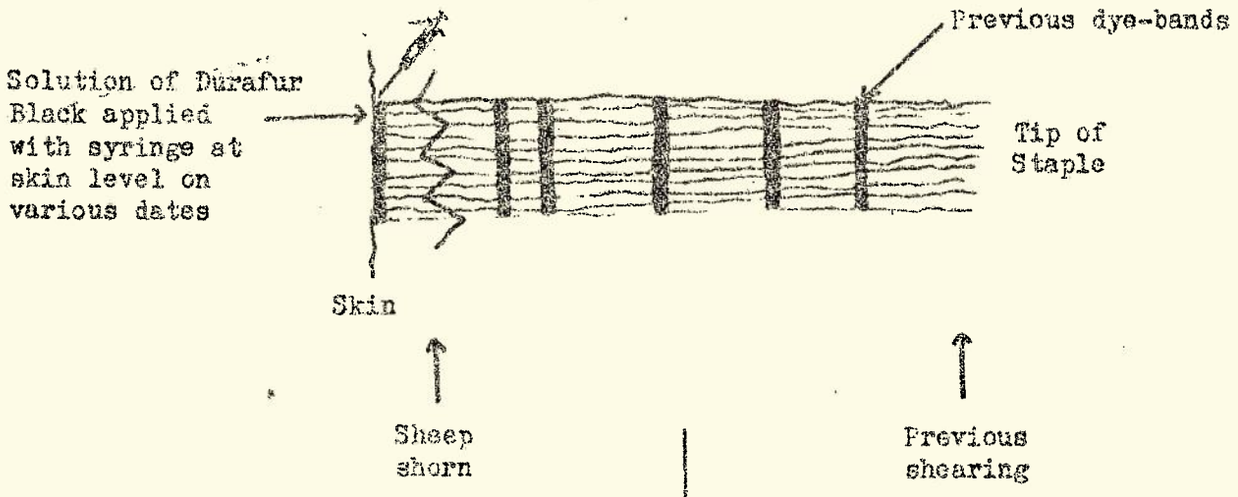
REF: W.G. 3.1 78/79

SUMMARY:

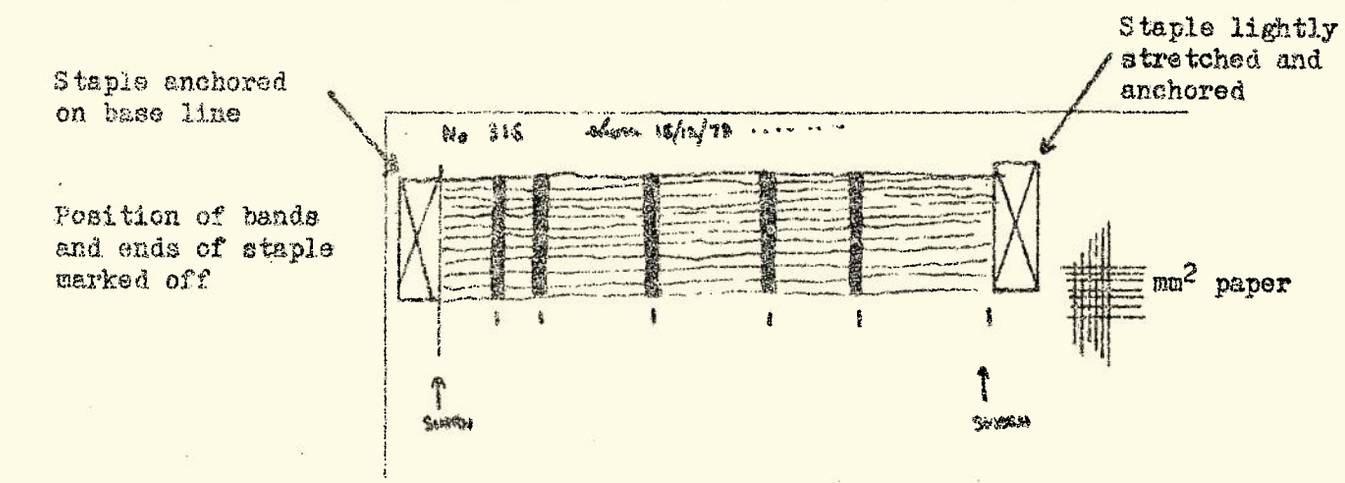
Observational studies on the pattern of wool growth in a range of ages and classes of sheep have been carried out using a modified dye-banding technique. Entire staples were measured and the Mean % Staple Growth in periods of known length calculated (TABLES 1A - 7). Mean % Daily Staple Growth was also calculated and plotted in the form of histograms (FIGS 1 - 26), for lactating ewes and dry sheep from the Two Pasture System Trial (1.1) and the Dry Sheep Investigation (1.3).

DYEBANDING & STAPLE MEASUREMENT TECHNIQUE

TYPICAL STAPLE ON FLANK OF SHEEP



e.g. TYPICAL STAPLE UNDERGOING MEASUREMENT



Lengths and intervals for a number of staples are then tabulated e.g:

Date: 18/12/78 ↔ 12/1/79.....

Period:	6	5	4	3	2	1	TOTAL
No. 316	7.3	6.0	15.8	16.2	12.7	18.5	76.5mm
Conversion to % growth per period e.g:	9.5	7.8	20.6	21.2	16.6	24.3	100%

These % growth per period figures were averaged vertically for a number of sheep with the same history (e.g. same age; all weaned a lamb etc.) to give MEAN % STAPLE GROWTH PER PERIOD as in the following tables, together with the SAMPLE SIZE and STANDARD ERROR of the MEAN.

The % DAILY STAPLE GROWTH (PER PERIOD) was derived by dividing the MEAN % STAPLE GROWTH PER PERIOD by the number of days in the period (i.e. between bands).

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.1 78/79

TABLE 1A: 78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

		PERIOD:	1	2	3	4	5
			9/1/78 ← → 1/3/78	← → 31/5/78	← → 15/3/78	← → 12/1/79	← → 26/2/79
				DB	DB	DB	DB
		DAYS:	51	91	76	150	45
			SHORN	(LACTATION)	SHORN	MATING (WINTER)	(LAMBING)	(LACTATION)	SHORN
'71 AGE ('A') EWES (4 CROP) 1 SHORN JAN	MEAN % STAPLE GROWTH:		35.7	17.8	17.8	19.7	9.0
	SAMPLE SIZE:		5	5	5	5	5
	STANDARD ERROR:		±2.08	±1.52	±1.68	±2.32	±0.81
	% DAILY STAPLE GROWTH:		0.700	0.196	0.234	0.131	0.200
'71 AGE ('A') EWES (4 CROP) 2 SHORN MAR	MEAN % STAPLE GROWTH:		-	31.9	21.6	29.4	16.5
	SAMPLE SIZE:		-	6	6	6	6
	STANDARD ERROR:		-	±2.33	±1.08	±3.99	±3.02
	% DAILY STAPLE GROWTH:		-	0.350	0.284	0.196	0.367
'72 AGE ('B') EWES (3 CROP) 1 SHORN JAN	MEAN % STAPLE GROWTH:		28.3	16.7	17.7	28.8	8.5
	SAMPLE SIZE:		3	3	3	3	3
	STANDARD ERROR:		±3.53	±1.64	±2.89	±4.78	±0.75
	% DAILY STAPLE GROWTH:		0.555	0.183	0.233	0.192	0.189
'72 AGE ('B') EWES (3 CROP) 2 SHORN MAR	MEAN % STAPLE GROWTH:		-	30.5	22.2	31.9	15.3
	SAMPLE SIZE:		-	10	10	10	10
	STANDARD ERROR:		-	±3.76	±1.50	±2.21	±2.42
	% DAILY STAPLE GROWTH:		-	0.335	0.292	0.213	0.340

1 SAMPLE GROUP SHORN 9/1/78
2 SAMPLE SHEEP SHORN 1/3/78

ALL EWES WEANED A LAMB
DB - STAPLES DYE-BANDED ON THESE DATES
ALL DATA FROM FYRGS (R) (1.1) 78/79

T.P.M. 9/79

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.1 78/79

TABLE 1B: 78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

	PERIOD:	1	2	3	4	5
		9/1/78	1/3/78 — 31/5/78		15/3/78 — 12/1/79	26/2/79
			DB	DB	DB	DB
	DAYS:	51	91	76	150	45
		SHORN (LACTATION)	SHORN MATING	(WINTER)	(LAMBING)	(LACTATION) SHORN
'73 AGE('C') EWES (2 CROP) 1 SHORN JAN	MEAN % STAPLE GROWTH:	23.7	22.5	17.5	26.0	10.5
	SAMPLE SIZE:	12	12	12	12	12
	STANDARD ERROR:	±2.88	±2.01	±0.99	±1.88	±1.29
	% DAILY STAPLE GROWTH:	0.465	0.245	0.230	0.173	0.233
'73 AGE ('C') EWES (2 CROP) 2 SHORN MAR	MEAN % STAPLE GROWTH:	-	35.7	22.5	29.4	12.3
	SAMPLE SIZE.	-	1	7	7	7
	STANDARD ERROR:	-	±1.45	±0.86	±1.63	±1.53
	% DAILY STAPLE GROWTH:	-	0.392	0.296	0.196	0.273
'74 AGE ('D') EWES (1 CROP) 1 SHORN JAN	MEAN % STAPLE GROWTH:	17.7	25.4	18.1	27.2	11.5
	SAMPLE SIZE:	11	11	11	11	11
	STANDARD ERROR:	±2.77	±2.35	±0.98	±1.28	±1.72
	% DAILY STAPLE GROWTH:	0.347	0.279	0.238	0.181	0.256
'74 AGE ('D') EWES (1 CROP) 2 SHORN MAR	MEAN % STAPLE GROWTH:	-	35.5	20.4	32.5	11.4
	SAMPLE SIZE:	-	11	11	11	11
	STANDARD ERROR:	-	±2.66	±1.80	±2.18	±1.25
	% DAILY STAPLE GROWTH:	-	0.390	0.268	0.217	0.253

1 SHEEP SHORN 9/1/78
2 SHEEP SHORN 1/3/78

ALL EWES WEANED A LAMB

DB - STAPLES DYE-BANDED ON THESE DATES

ALL DATA FROM FYRGS (R) (1.1) 78/79

T.P.M. 9/79

APPENDIX 2.1 WOOL GROWTH

REF: W.G. 3.1/1.1 78/79

TABLE 2: 78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) TREATMENT FLOCK

PERIOD:		1		2		3		4		5	
		9/1/78 ←		→ 1/3/78		→ 31/5/78		→ 15/8/78		→ 12/1/79	→ 26/2/79
			DB		DB		DB		DB		
DAYS:		SHORN	51 (LACTATION)		91 (MATING)		76 (WINTER)		150 (LAMBING)		45 (LACTATION)
'71 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:		30.6		11.9		14.6		35.3		7.5
	SAMPLE SIZE:		4		4		4		4		4
	STANDARD ERROR:		±4.24		±2.37		±3.12		±1.37		±0.75
	% DAILY STAPLE GROWTH:		0.600		0.131		0.192		0.235		0.167
'72 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:		28.9		13.4		17.6		33.7		6.3
	SAMPLE SIZE:		5		5		5		5		5
	STANDARD ERROR:		±3.74		±2.21		±2.38		±4.90		±0.92
	% DAILY STAPLE GROWTH:		0.567		0.147		0.232		0.225		0.140
'74 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:		27.3		10.2		17.3		36.3		6.9
	SAMPLE SIZE:		3		3		3		3		3
	STANDARD ERROR:		±4.54		±1.73		±2.19		±3.38		±1.54
	% DAILY STAPLE GROWTH:		0.535		0.112		0.228		0.242		0.153

ALL SAMPLE SHEEP SHORN 9/1/78
NO INFORMATION AVAILABLE FOR 1/3/78 SHEARING
NO INFORMATION AVAILABLE FOR '73 AGE (2 CROP) EWES

ALL EWES WEANED A LAMB
DB - STAPLES DYE-BANDED ON THESE DATES
ALL DATA FROM FYRGS (R) (1.1) 78/79

T.P.M. 9/79

APPENDIX 3.1 WOOL GROWTH

PERIOD:

DAYS:

MEAN % STAPLE GROWTH:
SAMPLE SIZE:
STANDARD ERROR:
% DAILY STAPLE GROWTH:

'77 AGE
EAST HOGGS

MEAN % STAPLE GROWTH:
SAMPLE SIZE:
STANDARD ERROR:
% DAILY STAPLE GROWTH:

'77 AGE
WETHER HOGGS

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.1 78/79

TABLE 3: 78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING MAIDEN EWES FROM FYRGS (R) (1.1) CONTROL & TREATMENT FLOCKS

	PERIOD:	1	2	3	4	5
		DEC '77 ←	→ 31/5/78 ←	→ 15/8/78 ←	→ 12/1/79 ←	→ 26/2/79
			DB	DB	DB	
	DAYS:	*	75	150	45	
		SHORN	MATING	(WINTER)	(LAMBING)	(LACTATION) SHORN
'75 AGE ('E') MAIDEN EWES (0 CROP) CONTROL	MEAN % STAPLE GROWTH:	43.5	18.3	30.7	7.5	
	SAMPLE SIZE:	15	15	15	15	
	STANDARD ERROR:	±1.77	±0.84	±1.70	±0.65	
	% DAILY STAPLE GROWTH:	*	0.241	0.205	0.167	
'75 AGE ('5') MAIDEN EWES (0 CROP) TREATMENT	MEAN % STAPLE GROWTH:	42.0	18.4	33.4	6.2	
	SAMPLE SIZE:	14	14	14	14	
	STANDARD ERROR:	±0.71	±0.23	±0.91	±0.55	
	% DAILY STAPLE GROWTH:	*	0.242	0.223	0.138	

* SHEEP SHORN IN DECEMBER '77 BUT EXACT LENGTH OF PERIOD UNKNOWN

ALL EWES WEANED A LAMB
DB - STAPLES DYE-BANDED ON THESE DATES
ALL DATA FROM FYRGS (R) (1.1) 78/79

T.P.M. 9/79

APPENDIX 3.1 WOOL GROWTH

TABLE 2: 78/79 [illegible] WOOL

PERIOD:

		DAYS:			
171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:		171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:		172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:		174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	

ALL SAMPLE SHEEP SHORN 9/1/75
NO INFORMATION AVAILABLE FOR 1/3/76 SHEARING
NO INFORMATION AVAILABLE FOR '75 AGE (2 CROP)

APPENDIX 3.1 WOOL GROWTH

TABLE 2: 78/79 [illegible] WOOL

PERIOD:

		DAYS:			
171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:		171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:		172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:		174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	

ALL SAMPLE SHEEP SHORN 9/1/75
NO INFORMATION AVAILABLE FOR 1/3/76 SHEARING
NO INFORMATION AVAILABLE FOR '75 AGE (2 CROP)

APPENDIX 3.1 WOOL

TABLE 2

171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:		171 AGE ('1') EWES (4 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:		172 AGE ('2') EWES (3 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	
174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:		174 AGE ('4') EWES (1 CROP)	MEAN % STAPLE GROWTH:	
	SAMPLE SIZE:			SAMPLE SIZE:	
	STANDARD ERROR:			STANDARD ERROR:	
	% DAILY STAPLE GROWTH:			% DAILY STAPLE GROWTH:	

ALL SAMPLE SHEEP SHORN 9/1/75
NO INFORMATION AVAILABLE FOR 1/3/76 SHEARING
NO INFORMATION AVAILABLE FOR '75 AGE (2 CROP)

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.3 78/79

TABLE 1 - 78/79 SEASONAL WOOL GROWTH PATTERN - EWE & WETHER HOGGS

	PERIOD.	1	2	3	4	5	6	7
		20/10/77*	←	31/3/78	13/5/78	26/7/78	13/10/78	18/12/78
				DB	DB	DB	DB	
	DAYS:		162	43	74	79	66	
		BIRTH				(WINTER)		SHORN
'77 AGE EWE HOGGS	MEAN % STAPLE GROWTH:		47.2	9.3	14.7	14.7	13.9	
	SAMPLE SIZE:		22	22	22	22	22	
	STANDARD ERROR:		±0.64	±0.16	±0.39	±0.41	±0.36	
	% DAILY STAPLE GROWTH:		0.291	0.216	0.199	0.186	0.211	
'77 AGE WETHER HOGGS	MEAN % STAPLE GROWTH:		46.4	10.7	15.8	14.8	13.0	
	SAMPLE SIZE:		28	23	28	28	28	
	STANDARD ERROR:		±0.94	±0.34	±0.46	±0.41	±0.80	
	% DAILY STAPLE GROWTH:		0.286	0.249	0.213	0.187	0.197	

* ASSUMED MEAN BIRTH DATE

DB - STAPLES DYE-BANDED ON THESE DATES

ALL DATA FROM FYRGS (DS) (NA) (1.3) 78/79

T.F.M. 9/79

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.3 78/79

TABLE 5 : 78/79 SEASONAL WOOL GROWTH PATTERN - SHEARLING EWES & WETHERS

	PERIOD:	1		1x		2		3		4		5		6	
		13/12/77		16/1/78		15/2/78		31/3/78		13/5/78		26/7/78		13/10/78	18/12/78
	DAYS:	SHORN	34	DB	30	DB	44	DB	43	DB	74	DB	79 (WINTER)	DB	66 SHORN
'76 AGE SHEARLING EWES (1 SHEAR)	MEAN % STAPLE GROWTH:		8.9		18.4		14.1		13.5		15.8		16.9		12.2
	SAMPLE SIZE:		27		27		27		27		27		27		27
	STANDARD ERROR:		±1.03		±1.26		±0.50		±0.31		±0.60		±0.67		±1.06
	% DAILY STAPLE GROWTH:		0.262		0.613		0.320		0.314		0.213		0.214		0.185
'76 AGE SHEARLING WETHERS (1 SHEAR)	MEAN % STAPLE GROWTH:		13.0		12.0		13.9		12.7		16.2		15.7		15.3
	SAMPLE SIZE:		26		26		26		26		26		26		26
	STANDARD ERROR:		±1.17		±0.80		±0.58		±0.39		±0.72		±0.64		±1.09
	% DAILY STAPLE GROWTH:		0.382		0.400		0.316		0.295		0.219		0.199		0.232

DB - STAPLES DYE-BANDED ON THESE DATES

ALL DATA FROM FYRGS (DS) (NA) (1.3) 78/79

T.P.M. 9/79

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.3 78/79

TABLE 6 : 78/79 SEASONAL WOOL GROWTH PATTERN - ADULT DRY EWES

		PERIOD:	1		2		3		4		5		6		7	
			13/12/77 ←	→ 16/2/78	←	→ 31/3/78	←	→ 13/5/78	←	→ 26/7/78	←	→ 13/10/78	←	→ 18/12/78	←	→ 12/2/79
		DAYS:	SHORN	65	DB SHORN	43	DB	43	DB	74	DB	79 (WINTER)	DD	66	DD	56	SHORN
'71 AGE DRY EWES (6 SHEAR)	MEAN % STAPLE GROWTH:		-		18.9		13.5		19.8		17.3		20.1		10.5	
	SAMPLE SIZE:		-		5		5		5		5		5		5	
	STANDARD EPROR:		-		±0.75		±0.79		±0.82		±0.81		±0.58		±1.31	
	% DAILY STAPLE GROWTH:		-		0.439		0.309		0.268		0.219		0.304		0.187	
'72 AGE DRY EWES (5 SHEAR)	MEAN % STAPLE GROWTH:		-		18.2		13.1		19.0		16.5		20.7		12.4	
	SAMPLE SIZE:		-		6		6		6		6		6		6	
	STANDARD ERROR:		-		±0.91		±0.60		±0.74		±0.50		±0.66		±0.47	
	% DAILY STAPLE GROWTH:		-		0.423		0.305		0.257		0.209		0.314		0.221	
'73 AGE DRY EWES (4 SHEAR)	MEAN % STAPLE GROWTH:		-		18.1		12.7		18.5		18.1		19.4		13.1	
	SAMPLE SIZE:		-		7		7		7		7		7		7	
	STANDARD ERROR:		-		±0.43		±0.45		±0.41		+0.62		±0.37		±0.21	
	% DAILY STAPLE GROWTH:		-		0.421		0.295		0.250		0.229		0.294		0.234	
'74 AGE DRY EWES (3 SHEAR)	MEAN % STAPLE GROWTH:		-		16.7		12.9		18.3		18.8		19.8		13.3	
	SAMPLE SIZE:		-		9		9		9		9		9		9	
	STANDARD ERROR:		-		±1.10		±0.39		±0.46		±0.54		±1.06		±0.60	
	% DAILY STAPLE GROWTH.		-		0.300		0.300		0.247		0.238		0.300		0.237	
'75 AGE DRY EWES (2 SHEAR)	MEAN % STAPLE GROWTH:		22.6*		12.3		10.0		14.7		14.6		16.2		9.3	
	SAMPLE SIZE:		3		3		3		3		3		3		3	
	STANDARD ERROR:		±2.55		±0.40		±0.45		±1.30		±0.81		±0.41		±1.44	
	% DAILY STAPLE GROWTH:		0.340		0.286		0.233		0.199		0.185		0.245		0.166	

* 2 SHEAR EWES SHORN DECEMBER PRIOR TO ENTERING ADULT FLOCK

DB-STAPLES DYE-BANDED ON THESE DATES

ALL DATA FROM FYRGS (DS) (NA) (1.3) 78/79

T.P.M. 9/79

APPENDIX 3.1 WOOL GROWTH

REF: W.G. 3.1/1.3 78/79

TABLE 7 : 78/79 SEASONAL WOOL GROWTH PATTERN - ADULT WETHERS

		PERIOD:	1	2	3	4	5	6
			13/12/77 ⟷ 16/2/78	⟷ 31/3/78	⟷ 13/5/78	⟷ 26/7/78	⟷ 13/10/78	⟷ 18/12/78
				DB	DB	DB	DB	DB
		DAYS:	SHORN 65	43	43	74	79 (WINTER)	66 SHORN
'72 AGE WETHERS (5 SHEAR)	MEAN % STAPLE GROWTH:		23.8	17.7	13.5	17.3	16.8	10.7
	SAMPLE SIZE:		3	3	3	3	3	3
	STANDARD ERROR:		±0.76	±1.73	±1.24	±1.25	±1.44	±1.14
	% DAILY STAPLE GROWTH:		0.366	0.412	0.314	0.234	0.213	0.162
'73 AGE WETHERS (4 SHEAR)	MEAN % STAPLE GROWTH:		19.9	14.3	19.6	19.6	16.3	14.2
	SAMPLE SIZE:		6	6	6	6	6	6
	STANDARD ERROR:		±3.41	±1.24	±2.70	±1.77	±2.17	±3.17
	% DAILY STAPLE GROWTH:		0.306	0.333	0.456	0.265	0.206	0.215
'74 AGE WETHERS (3 SHEAR)	MEAN % STAPLE GROWTH:		21.3	16.4	14.8	18.3	16.1	13.0
	SAMPLE SIZE:		10	10	10	10	10	10
	STANDARD ERROR:		±2.75	±1.29	±1.61	±0.58	±1.35	±1.92
	% DAILY STAPLE GROWTH:		0.328	0.381	0.344	0.247	0.204	0.199
'75 AGE WETHERS (2 SHEAR)	MEAN % STAPLE GROWTH:		22.8	16.7	14.9	17.2	17.1	11.3
	SAMPLE SIZE:		8	8	8	8	8	8
	STANDARD ERROR:		±2.05	±1.27	±1.05	±1.46	±1.88	±0.82
	% DAILY STAPLE GROWTH:		0.351	0.388	0.346	0.232	0.216	0.171

DB - STAPLES DYE-BANDED ON THESE DATES

ALL DATA FROM FYRCS (DS) (NA) (1.3) 78/79

T.P.M. 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

Refer to Table 1A

FIG 1: '71 AGE EWES (4 CROP) SHORN JANUARY

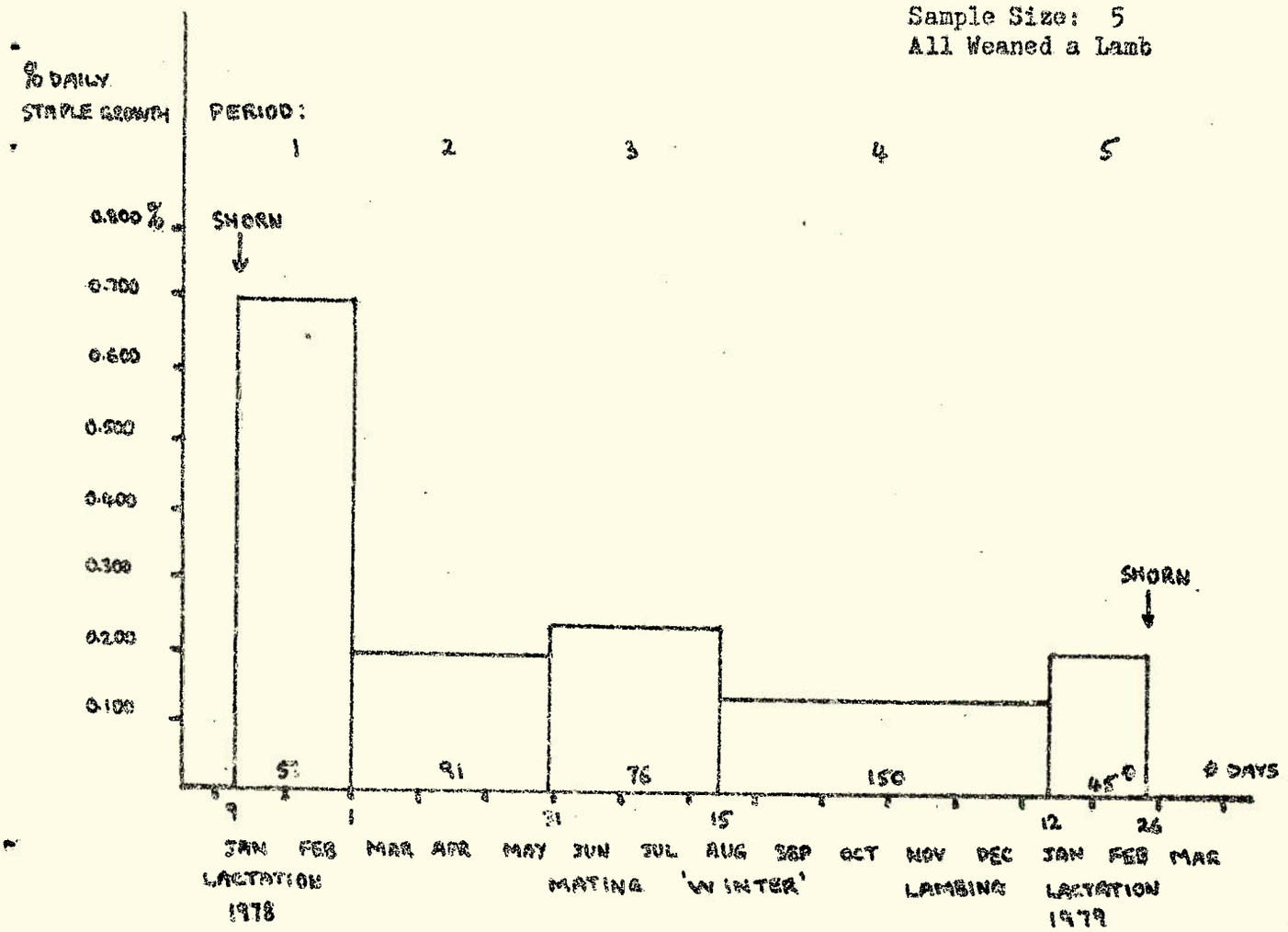
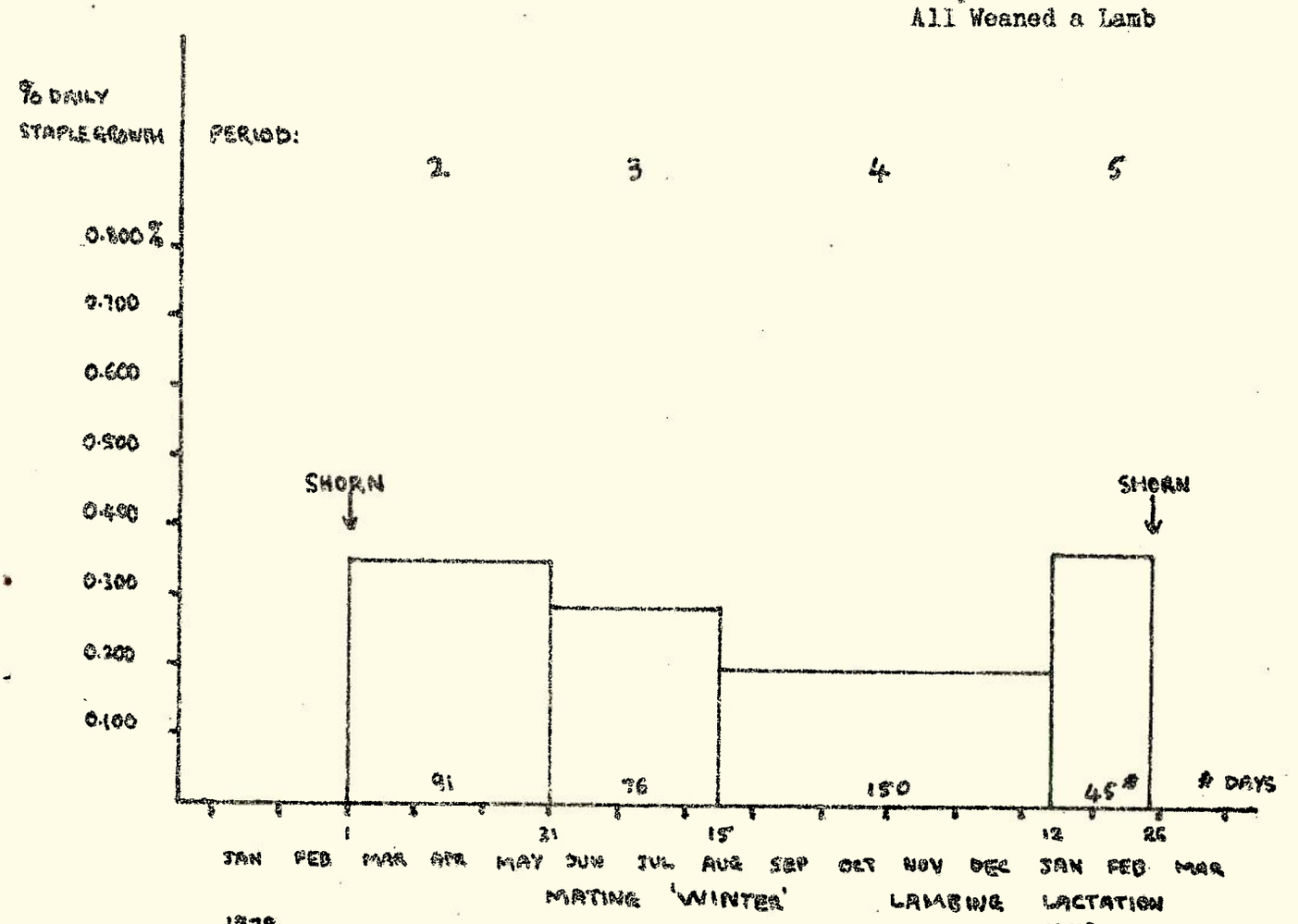


FIG 2: '71 AGE EWES (4 CROP) SHORN MARCH



DATA FROM FYRGS R (1.1) 78/79

T.P.M 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

Refer to Table 1A

FIG 3: '72 AGE EWES (3 CROP) SHORN JANUARY

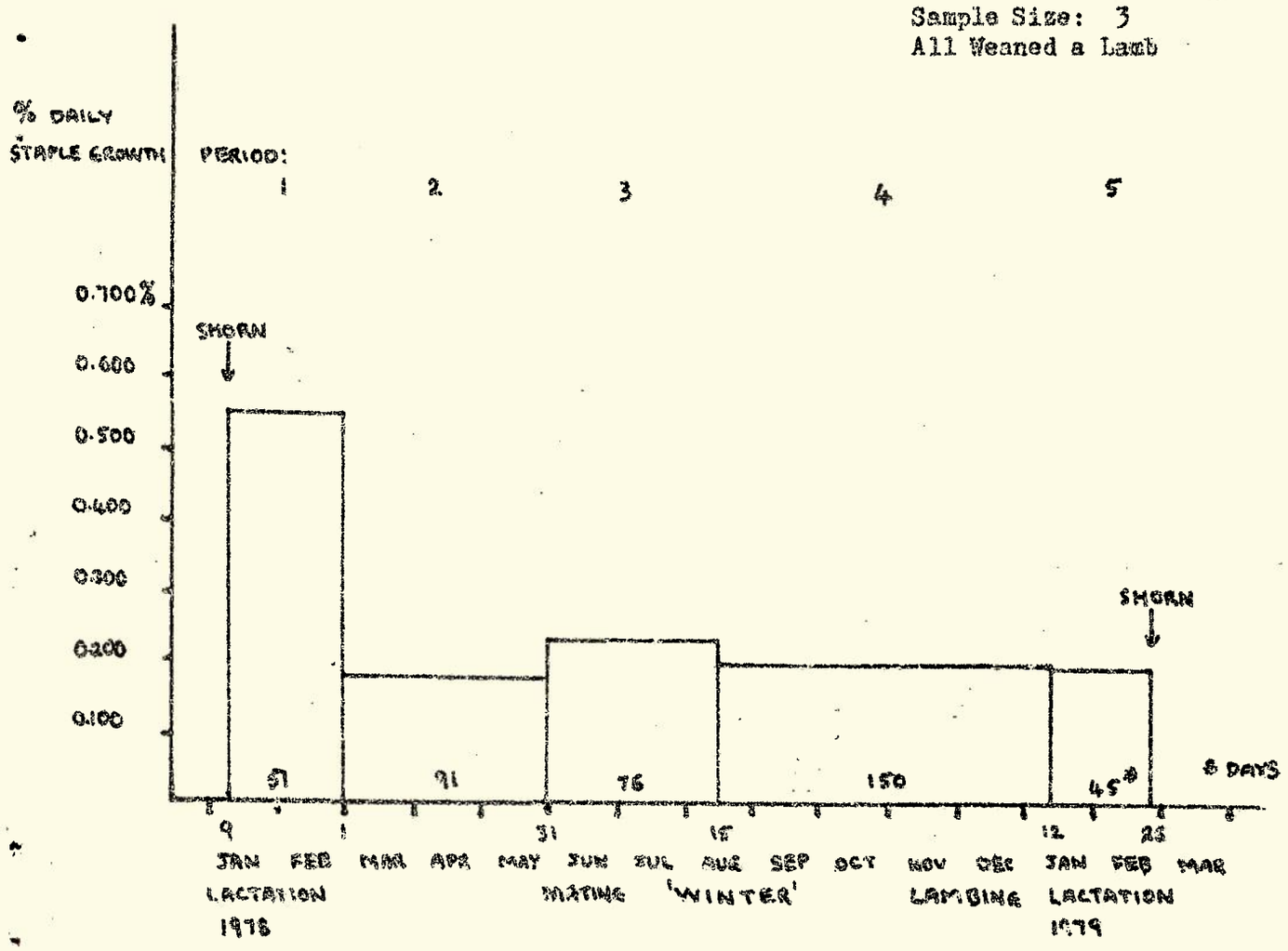
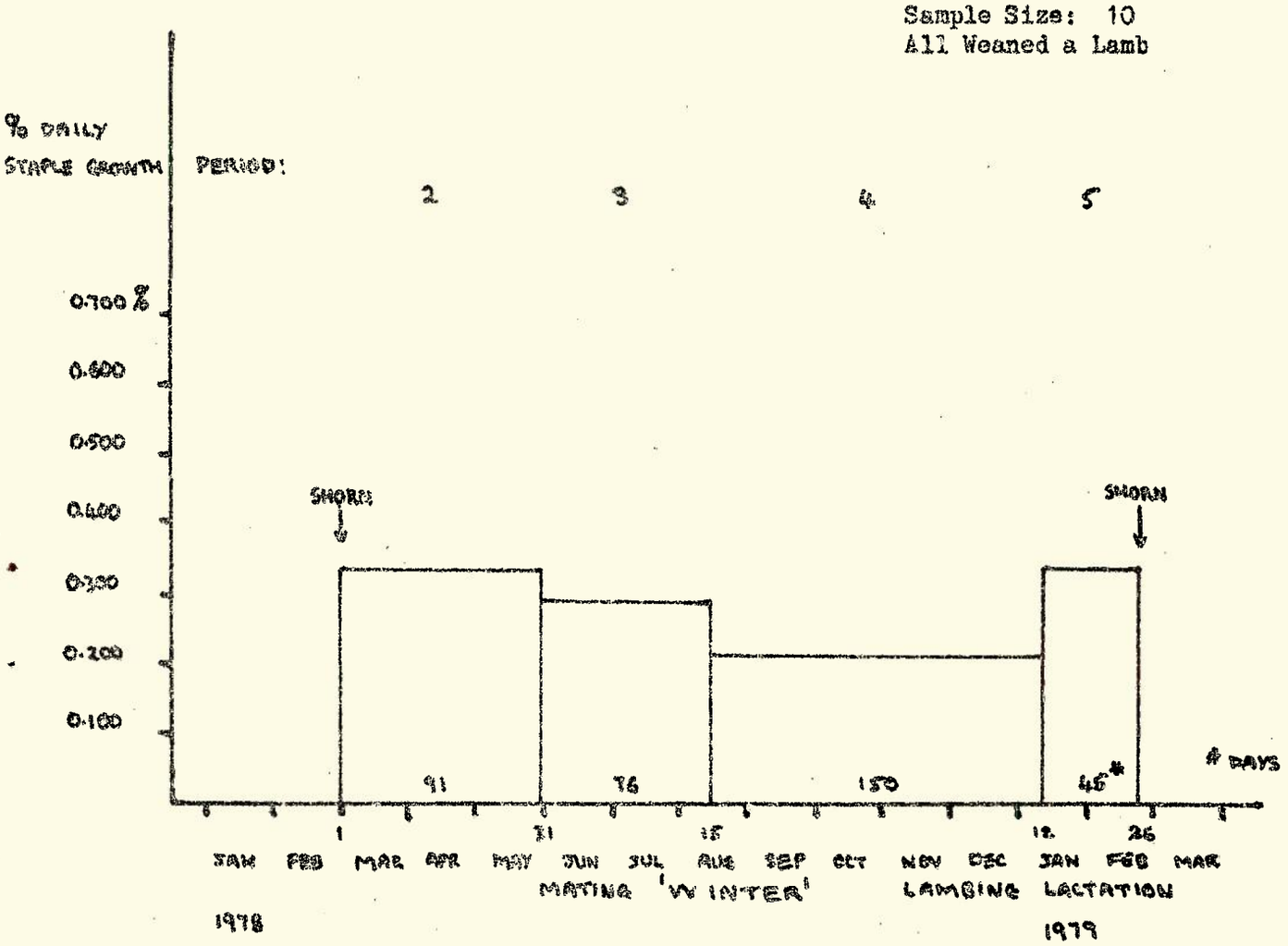


FIG 4: '72 AGE EWES (3 CROP) SHORN MARCH



DATA FROM FYRGS R (1.1) 78/79

T.P.M. 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

Refer to Table 1B

FIG 5: '73 AGE EWES (2 CROP) SHORN JANUARY

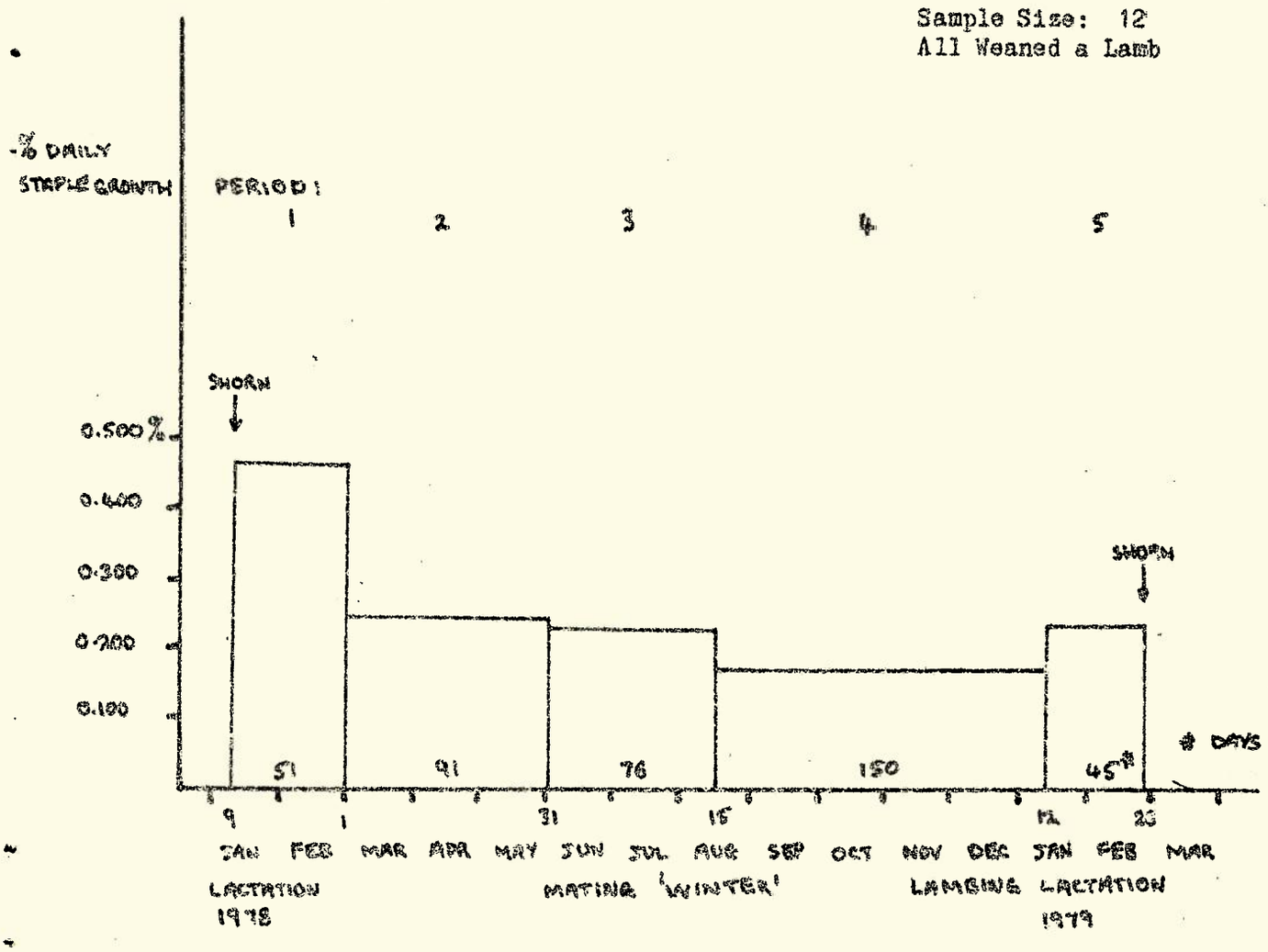
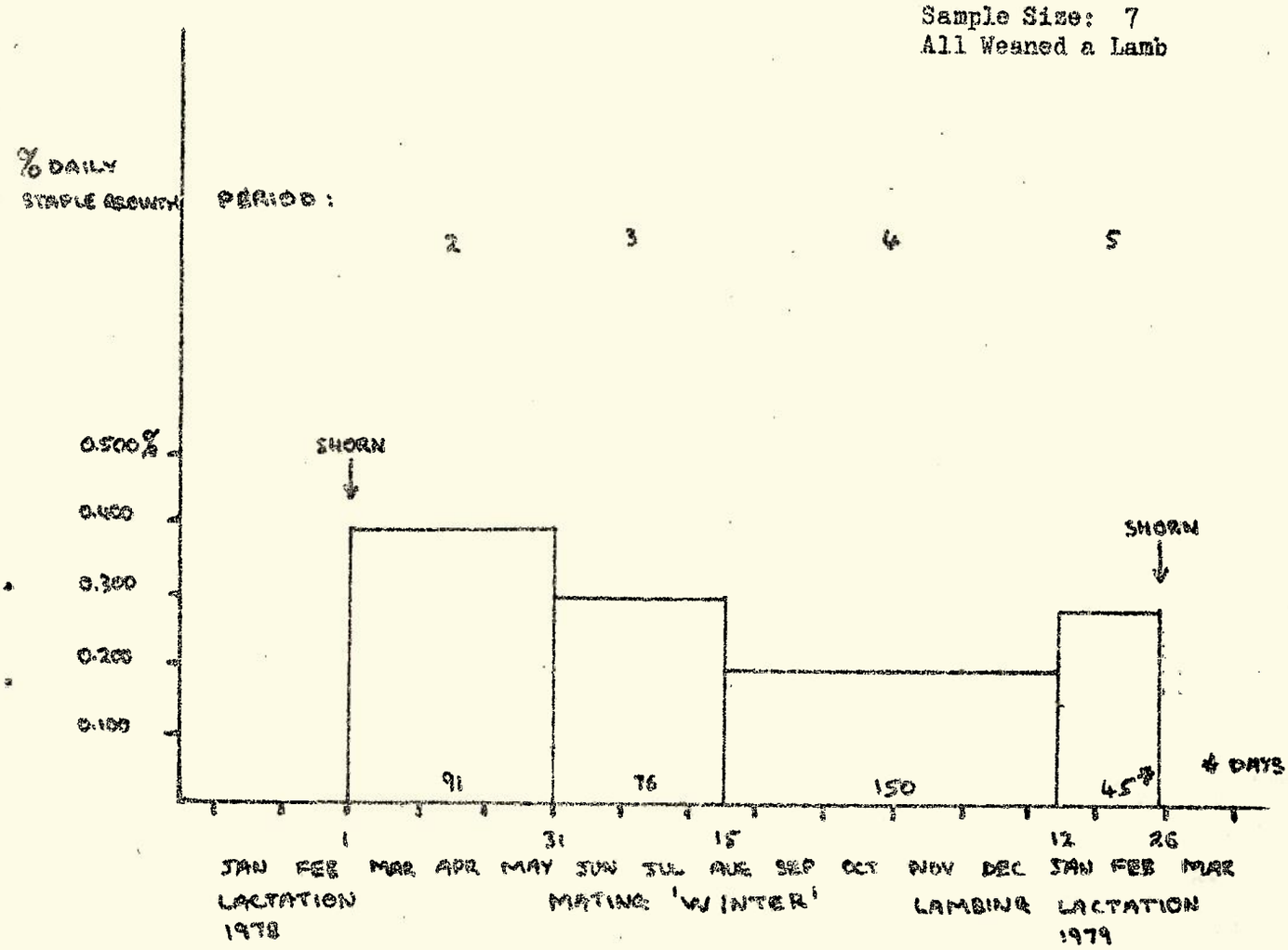
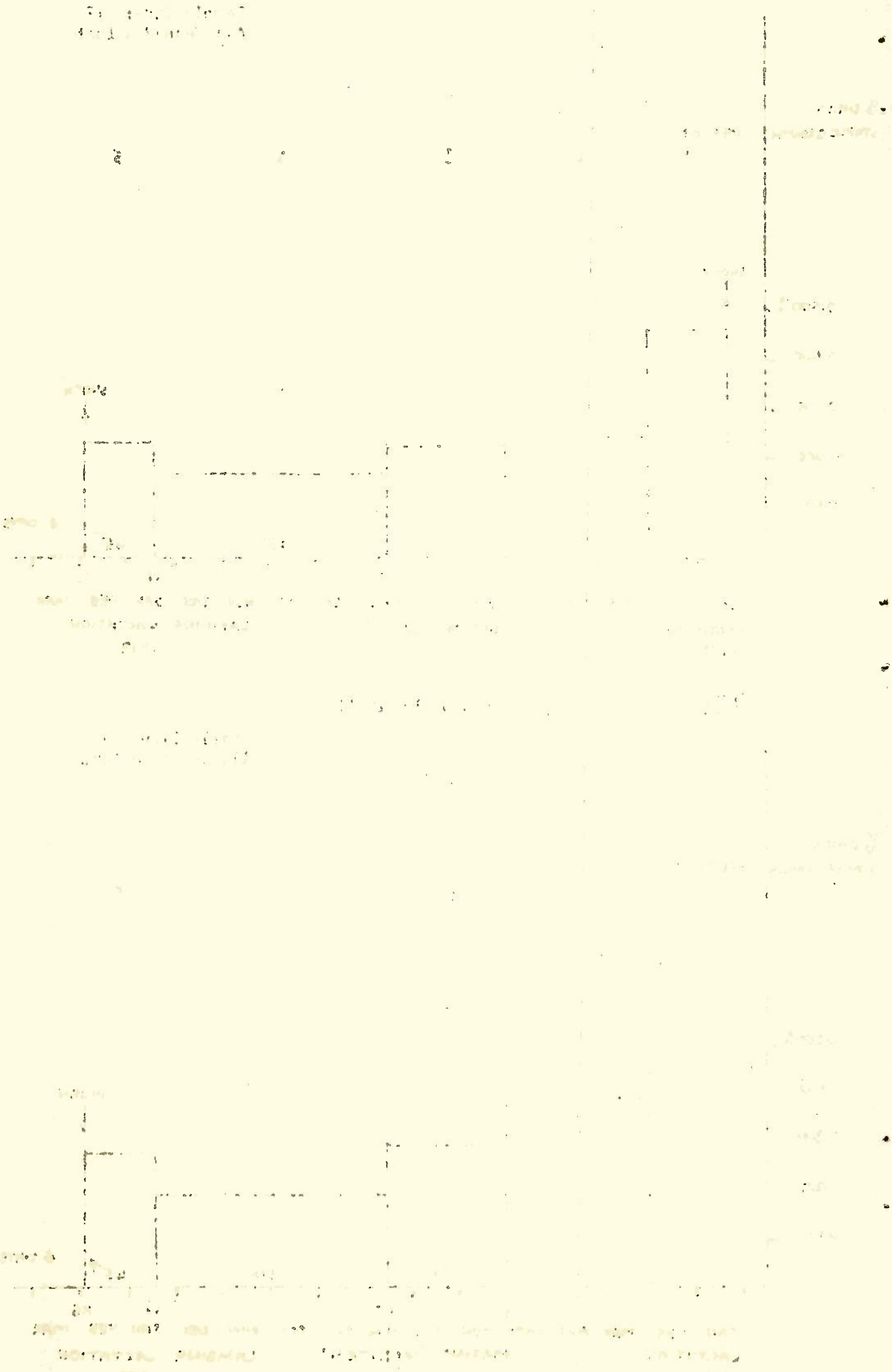


FIG 6: '73 AGE EWES (2 CROP) SHORN MARCH



DATA FROM FYRGS (1.1) 78/79

T.P.M. 9/79



78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) CONTROL FLOCK

Refer to Table 1B

FIG 7: '74 AGE EWES (1 CROP) SHORN JANUARY

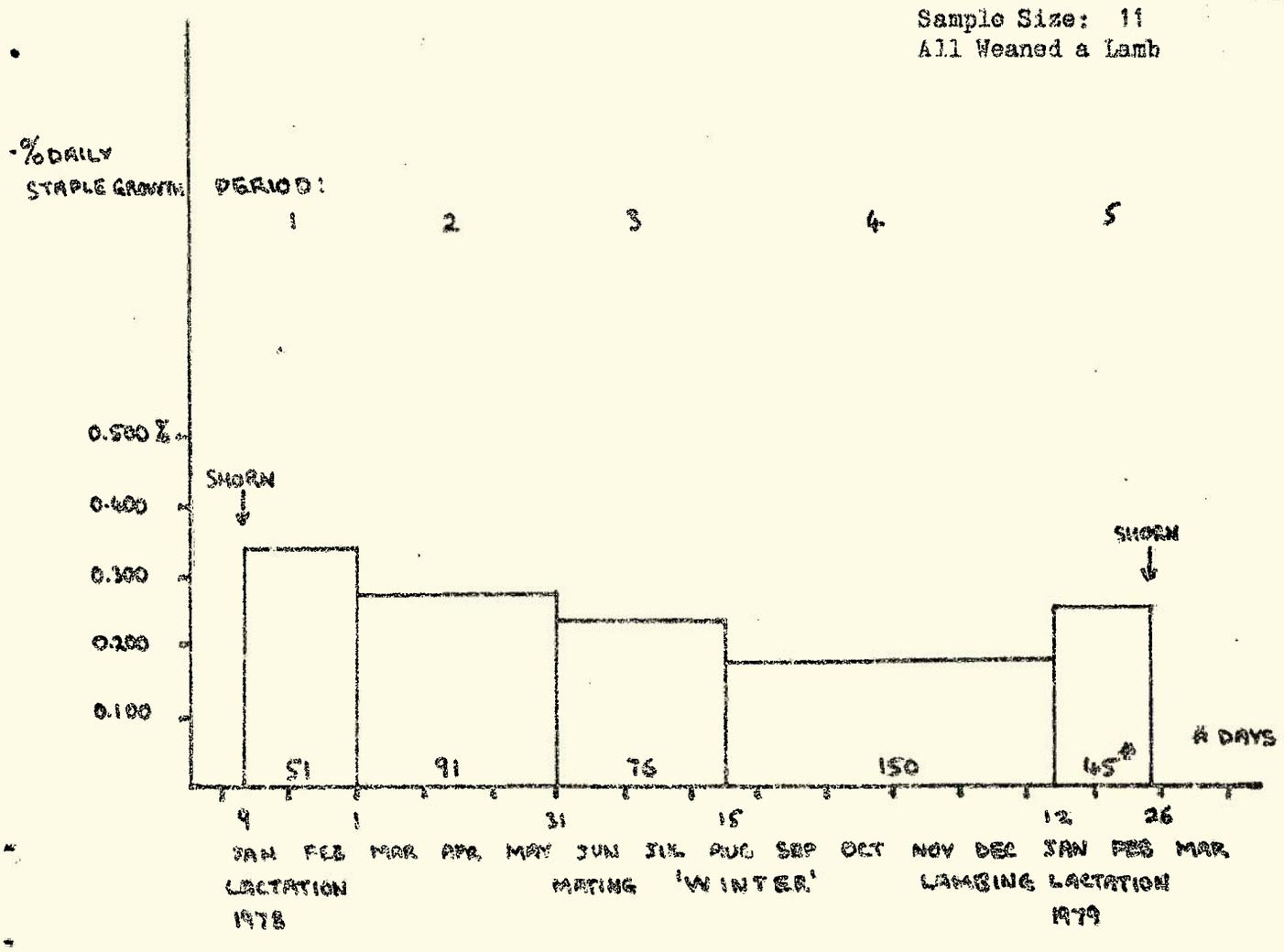
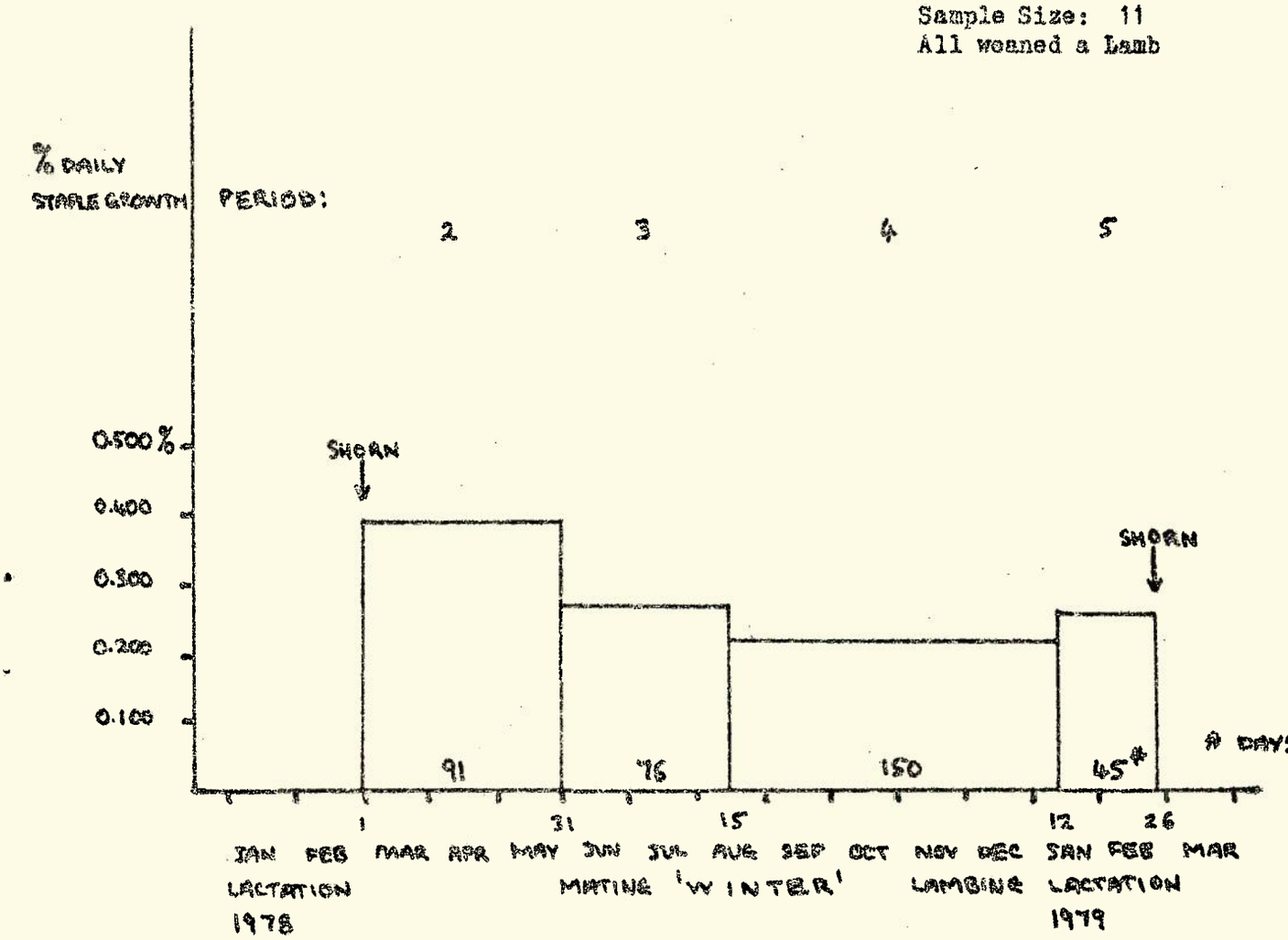
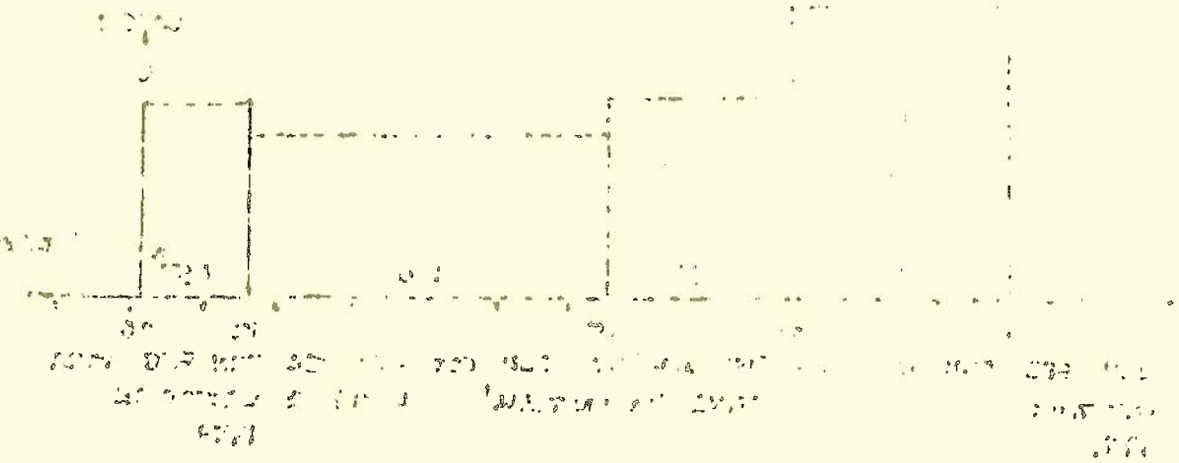


FIG 8: '74 AGE EWES (1 CROP) SHORN MARCH



DATA FROM FYRGS R (1.1) 78/79

T.P.M. 9/79



78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) TREATMENT FLOCK

Refer to Table 2

FIG 9: '71 AGE EWES (4 CROP) SHORN JANUARY

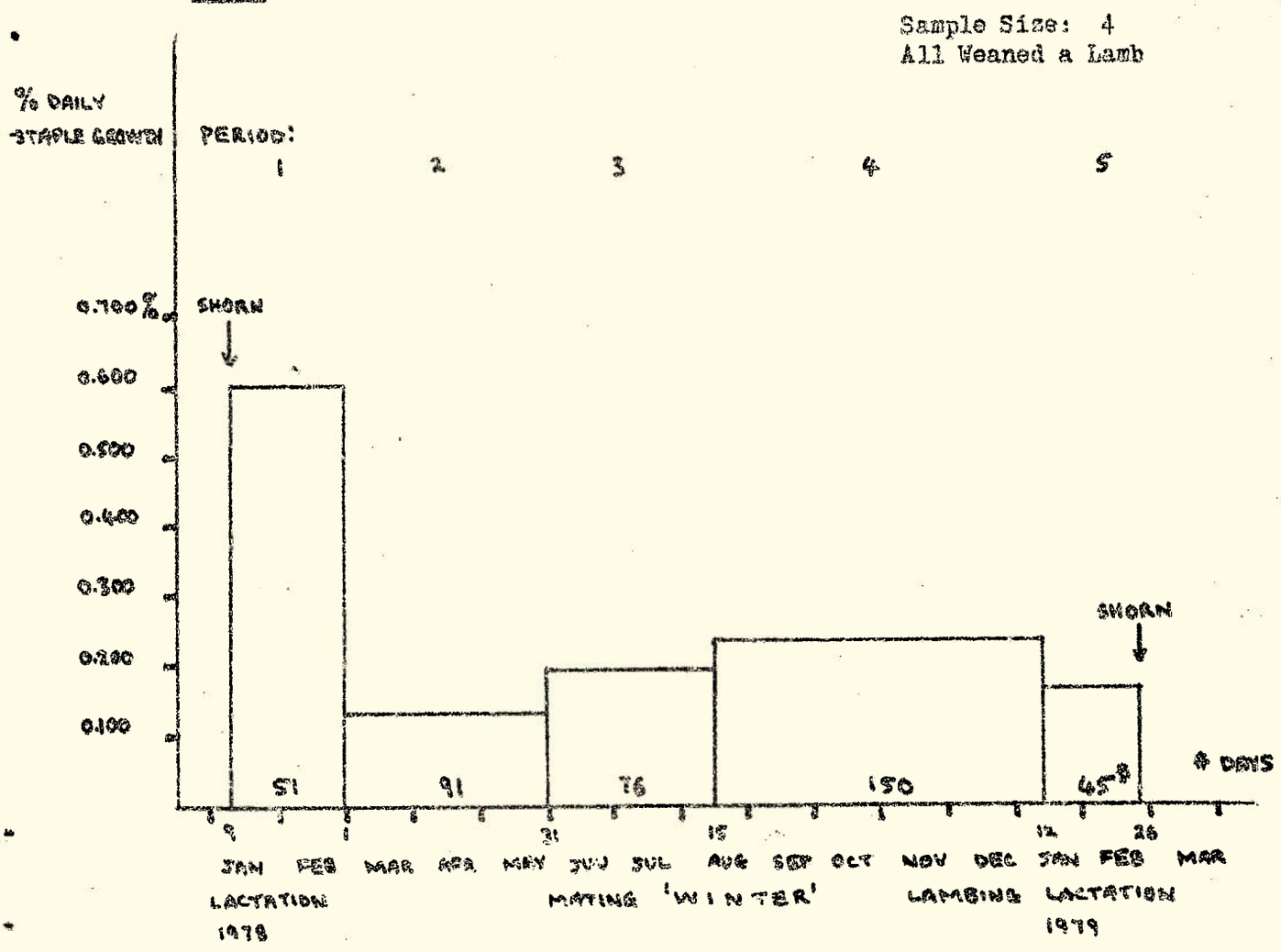
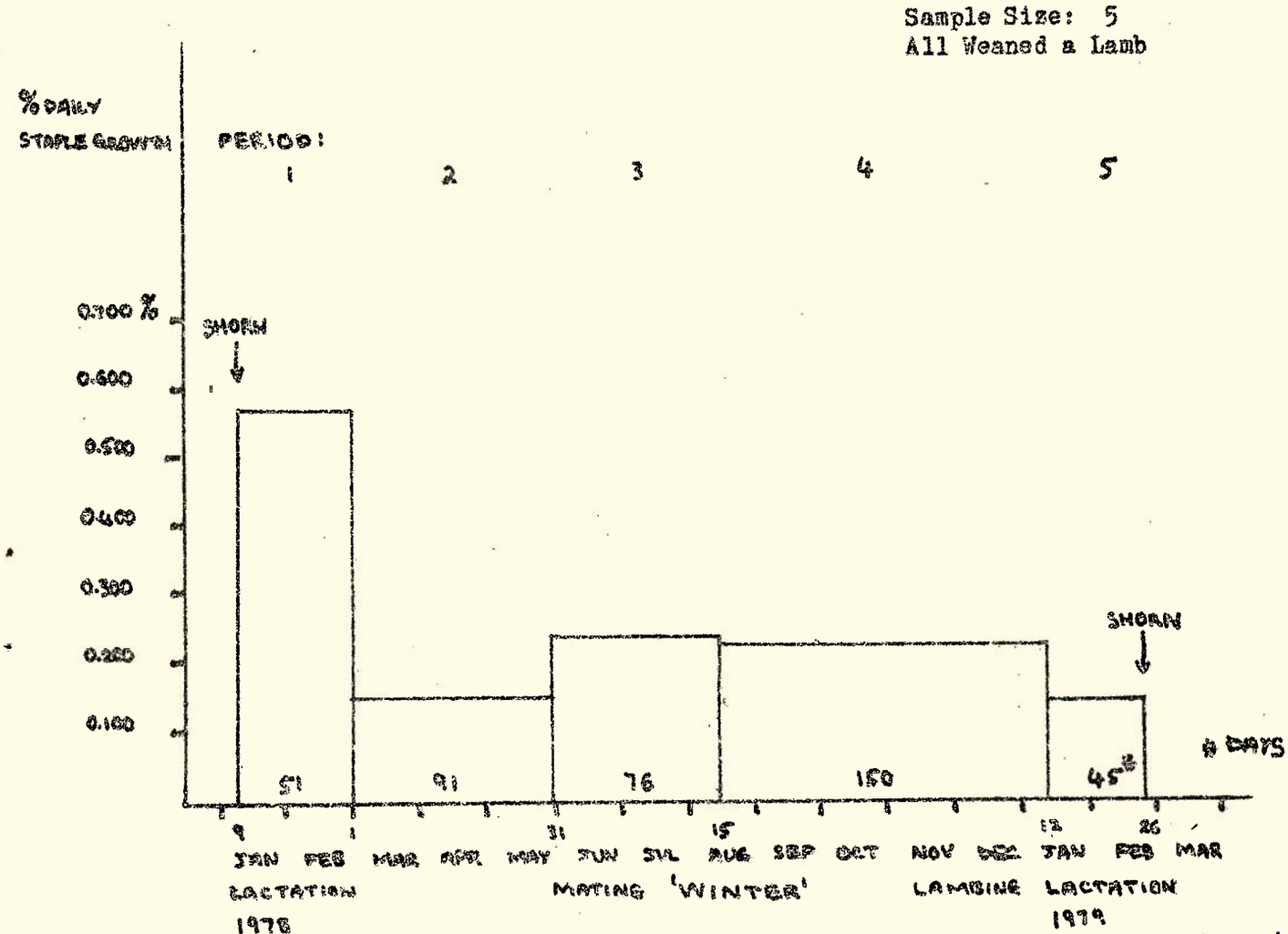


FIG 10: '72 AGE EWES (3 CROP) SHORN JANUARY



DATA FROM FYRGS R (1.1) 78/79

T.P.M. 9/79

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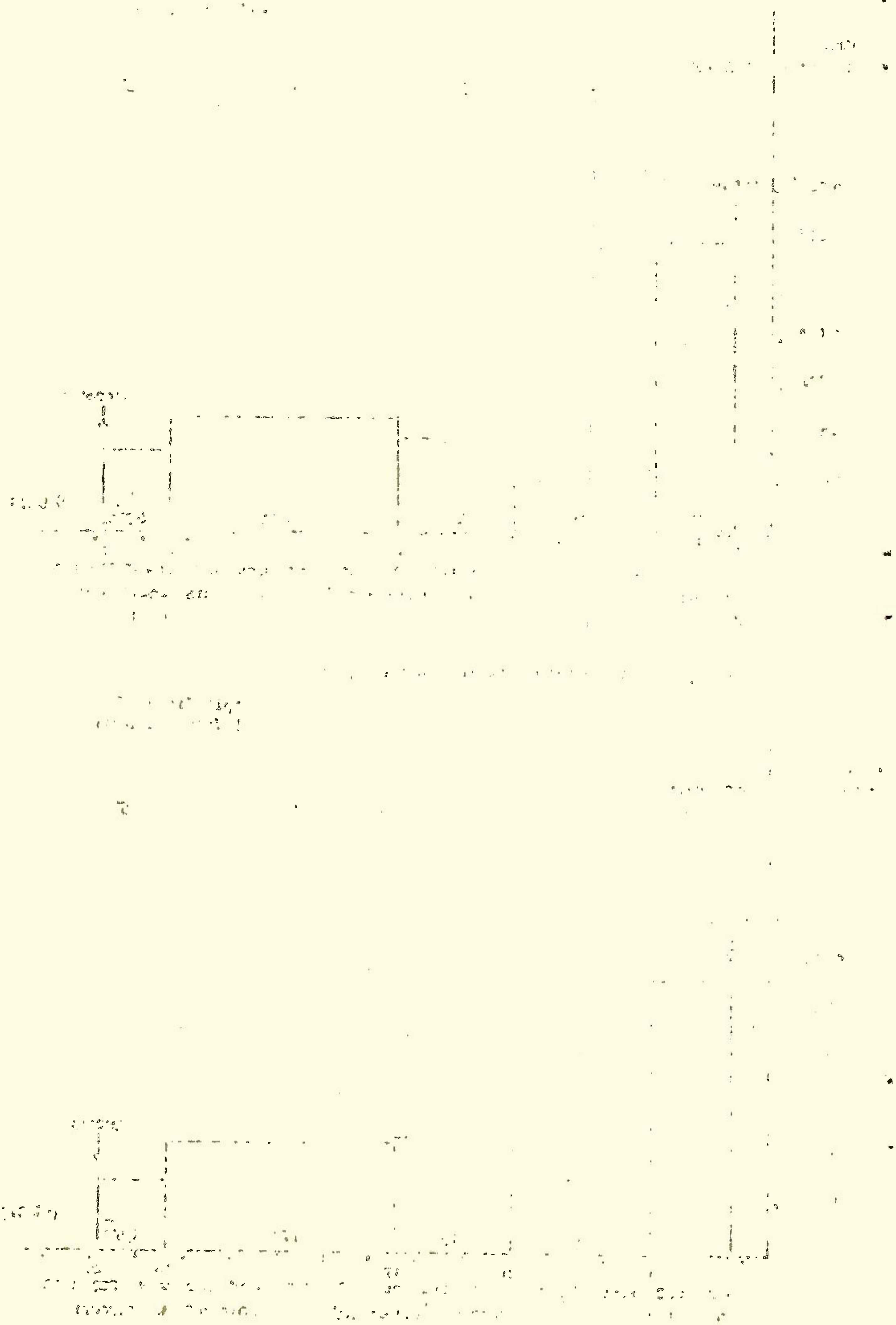
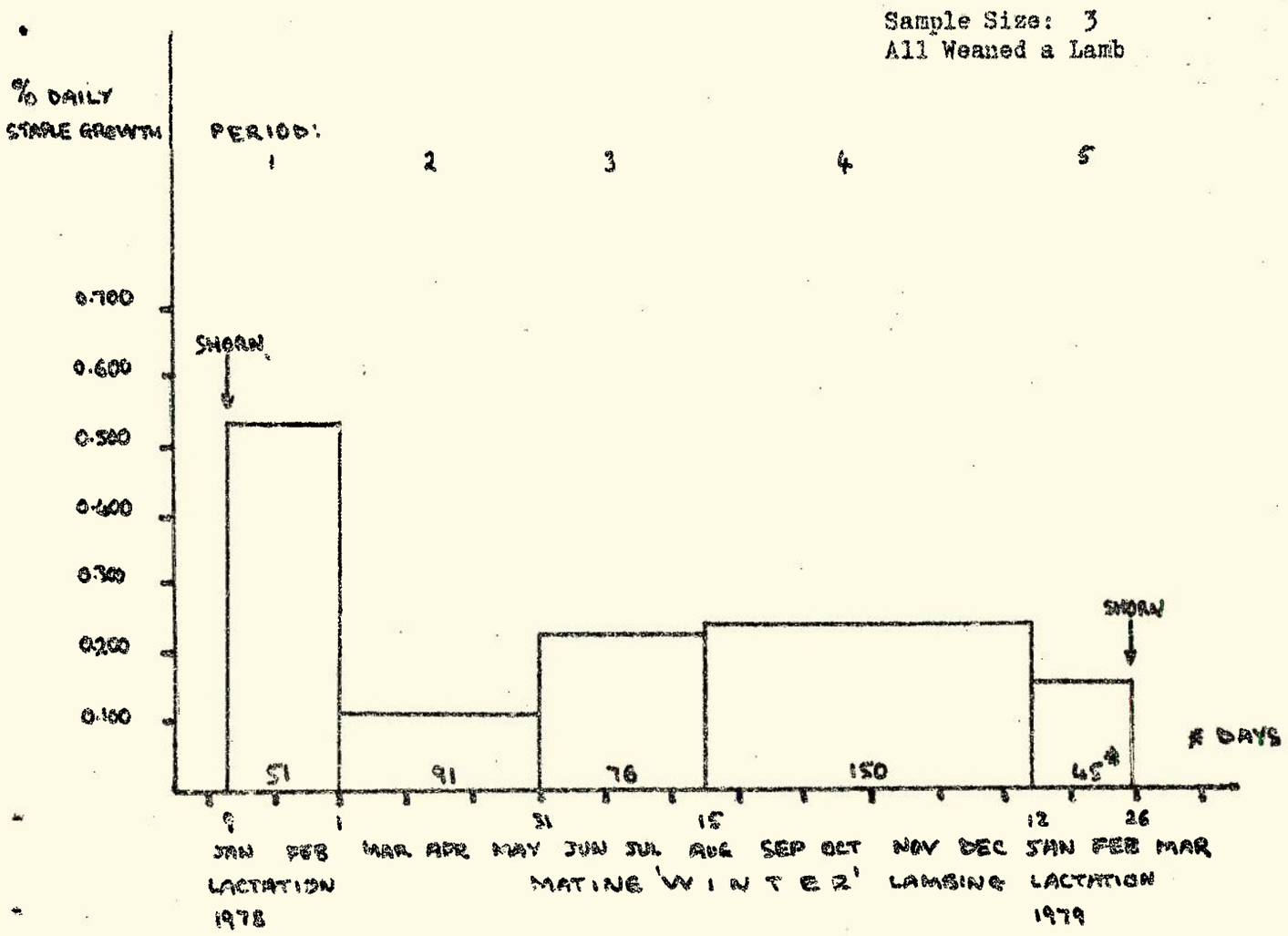


78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING EWES FROM FYRGS (R) (1.1) TREATMENT FLOCK

Refer to Table 2

FIG 11: '74 AGE EWES (1 CROP) SHORN JANUARY



DATA FROM FYRGS R (1.1) 78/79

T.P.M. 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - LACTATING MAIDEN EWES FROM FYRGS (R) (1.1)
CONTROL & TREATMENT FLOCKS

Refer to Table 3

FIG 12: '75 AGE MAIDEN EWES (0 CROP) CONTROL FLOCK

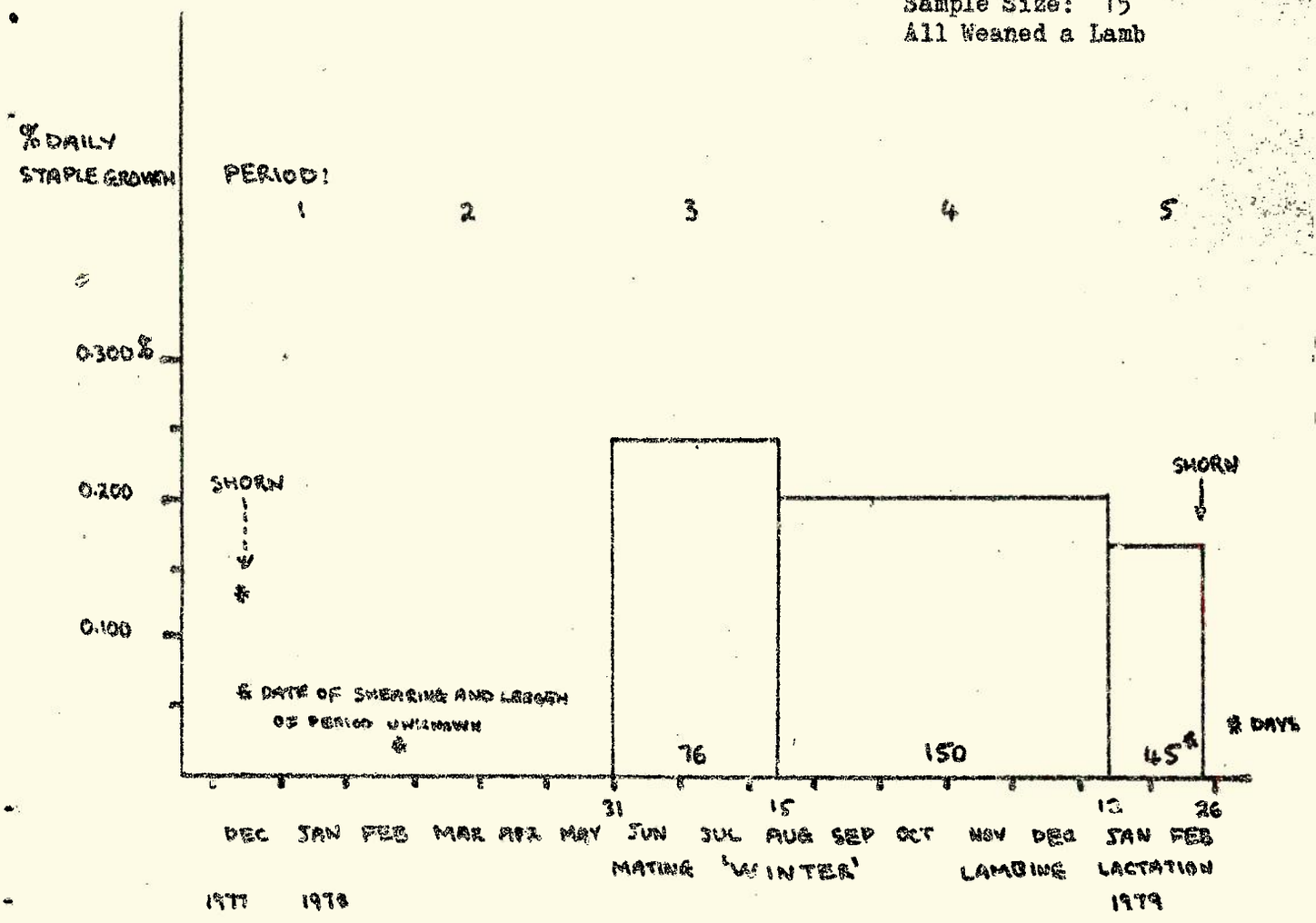
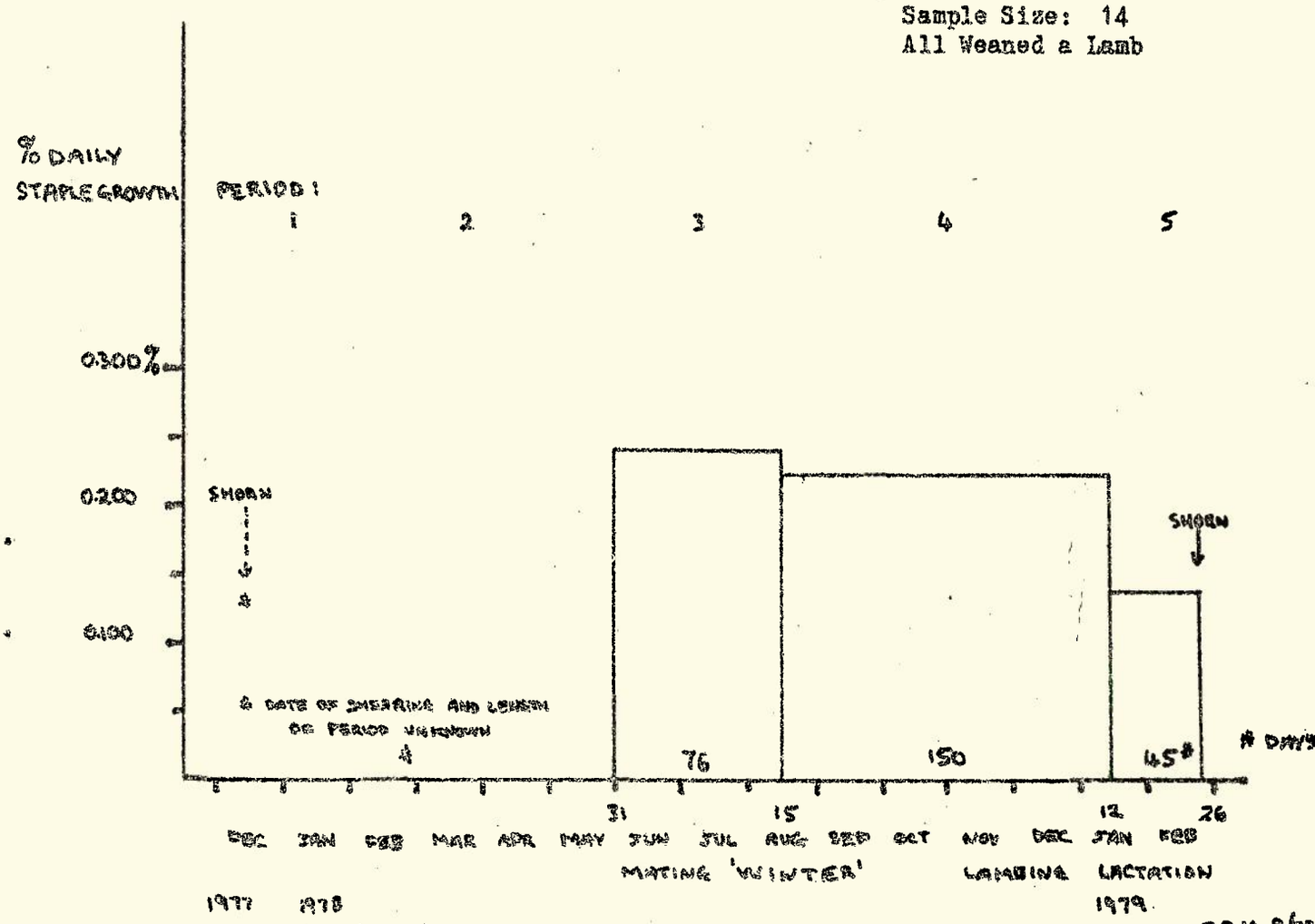
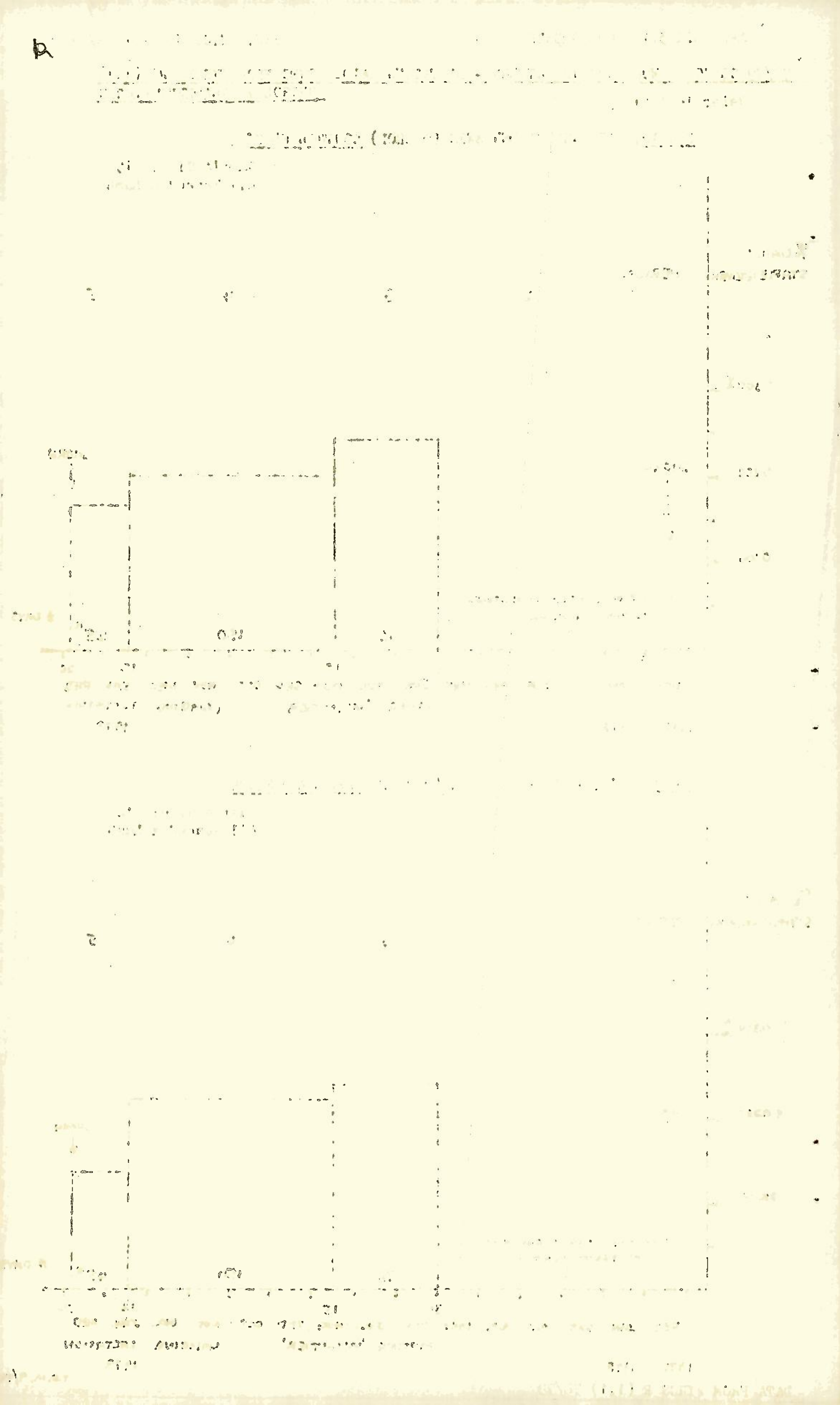


FIG 13: '75 AGE MAIDEN EWES (0 CROP) TREATMENT FLOCK



DATA FROM FYRGS R (1.1) 78/79

T.A.M. 9/79



78/79 SEASONAL WOOL GROWTH PATTERN - EWE & WETHER HOGGS

Refer to Table 4

FIG 14: '77 AGE EWE HOGGS

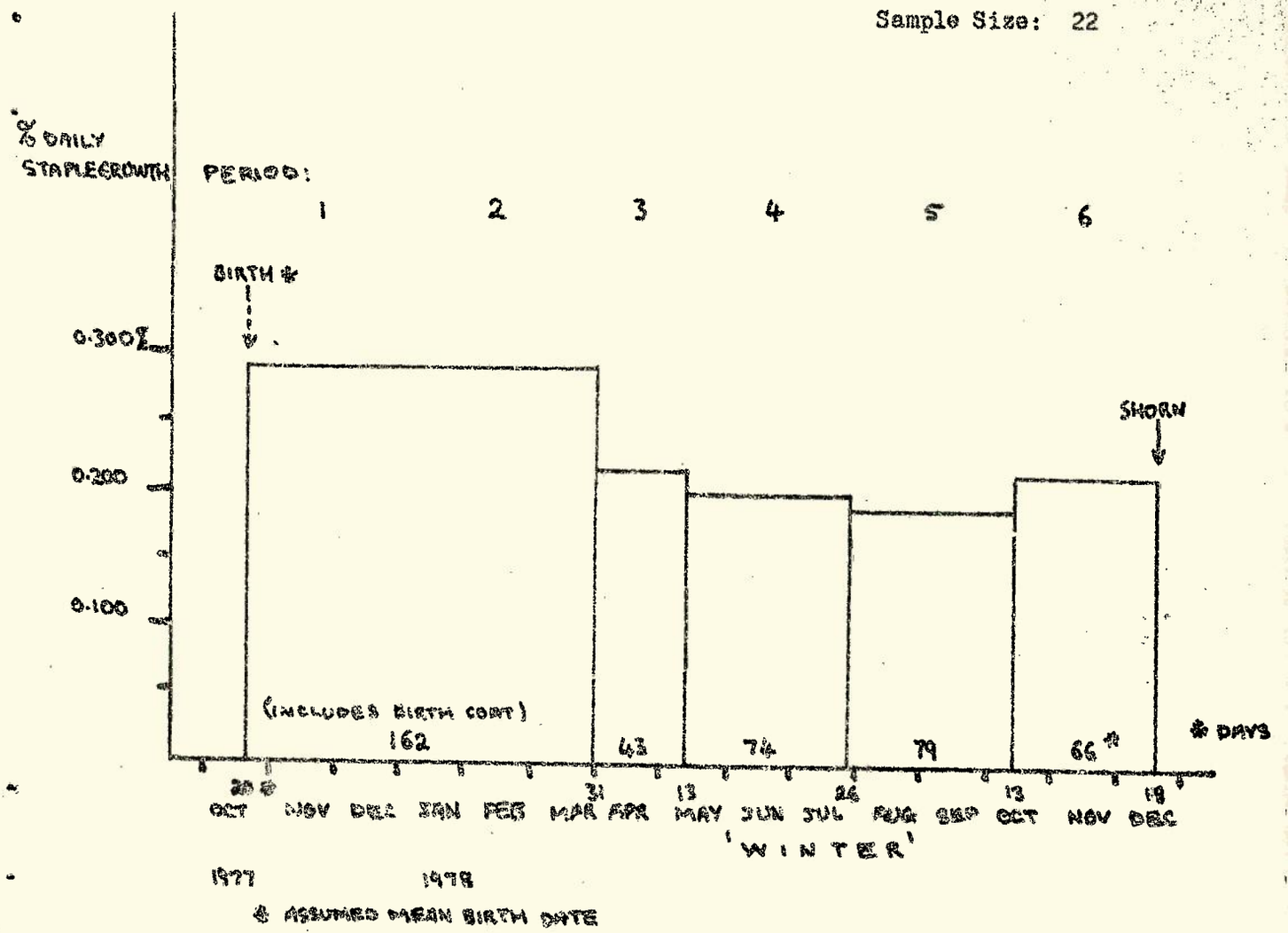
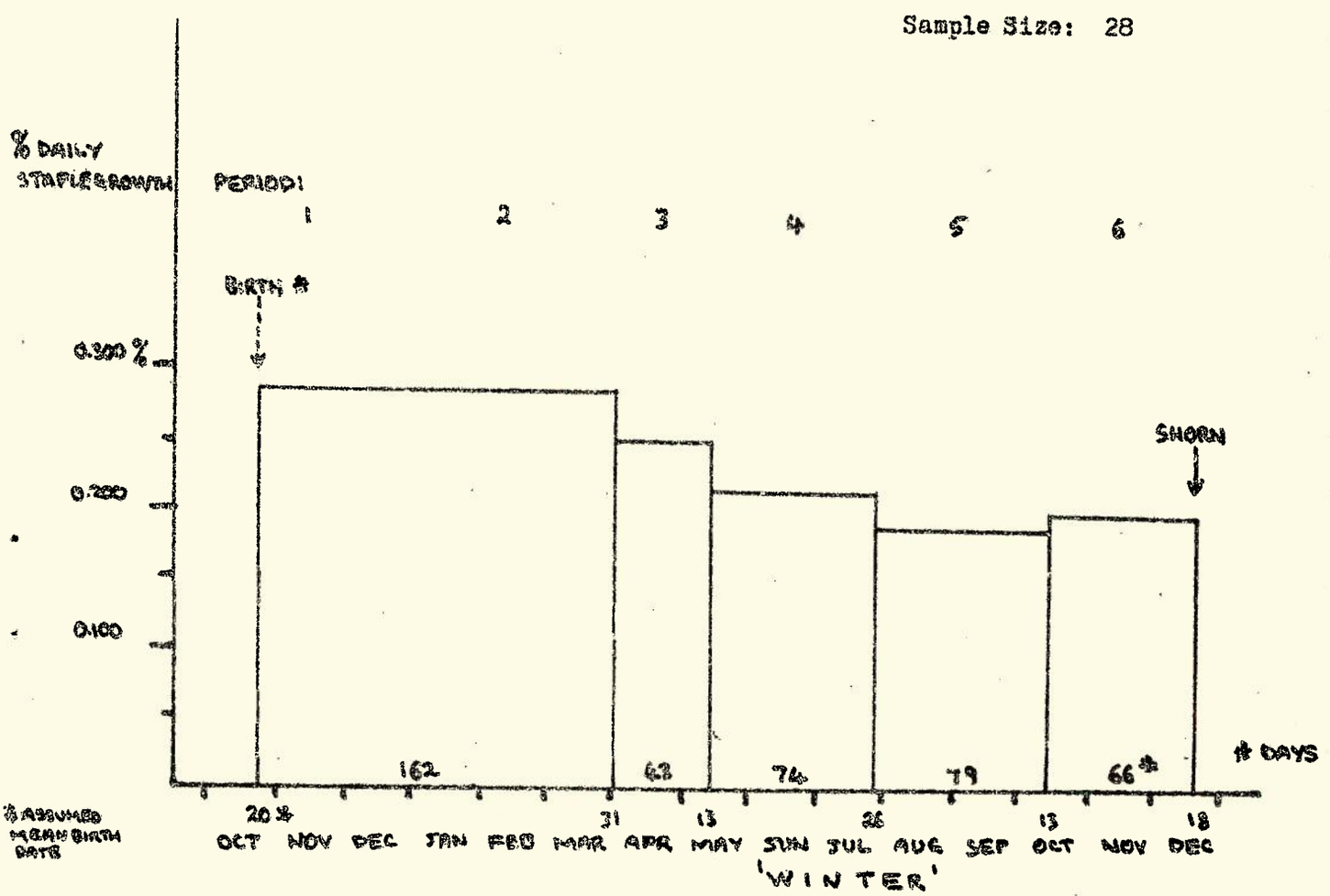
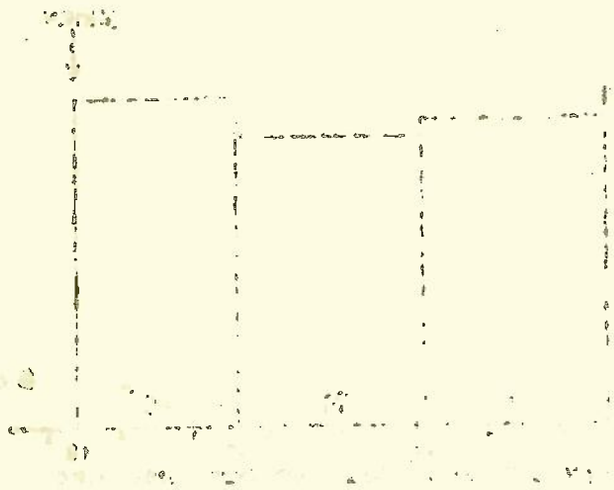


FIG 15: '77 AGE WETHER HOGGS





78/79 SEASONAL WOOL GROWTH PATTERN -- SHEARLING EWES & WETHERS

Refer to Table 5

FIG 16: '76 AGE SHEARLING EWES (1 SHEAR) SHORN DECEMBER

Sample Size: 27

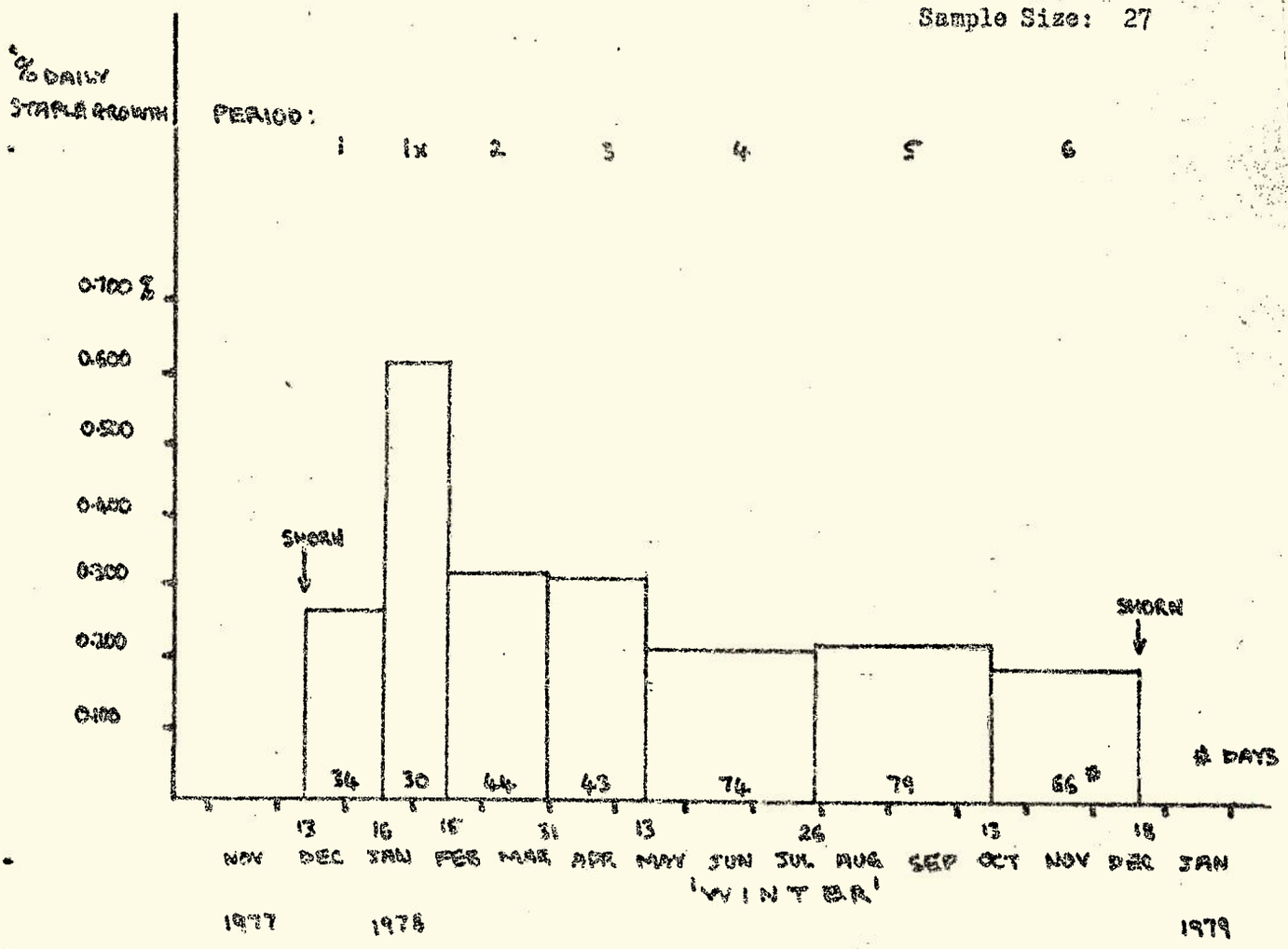
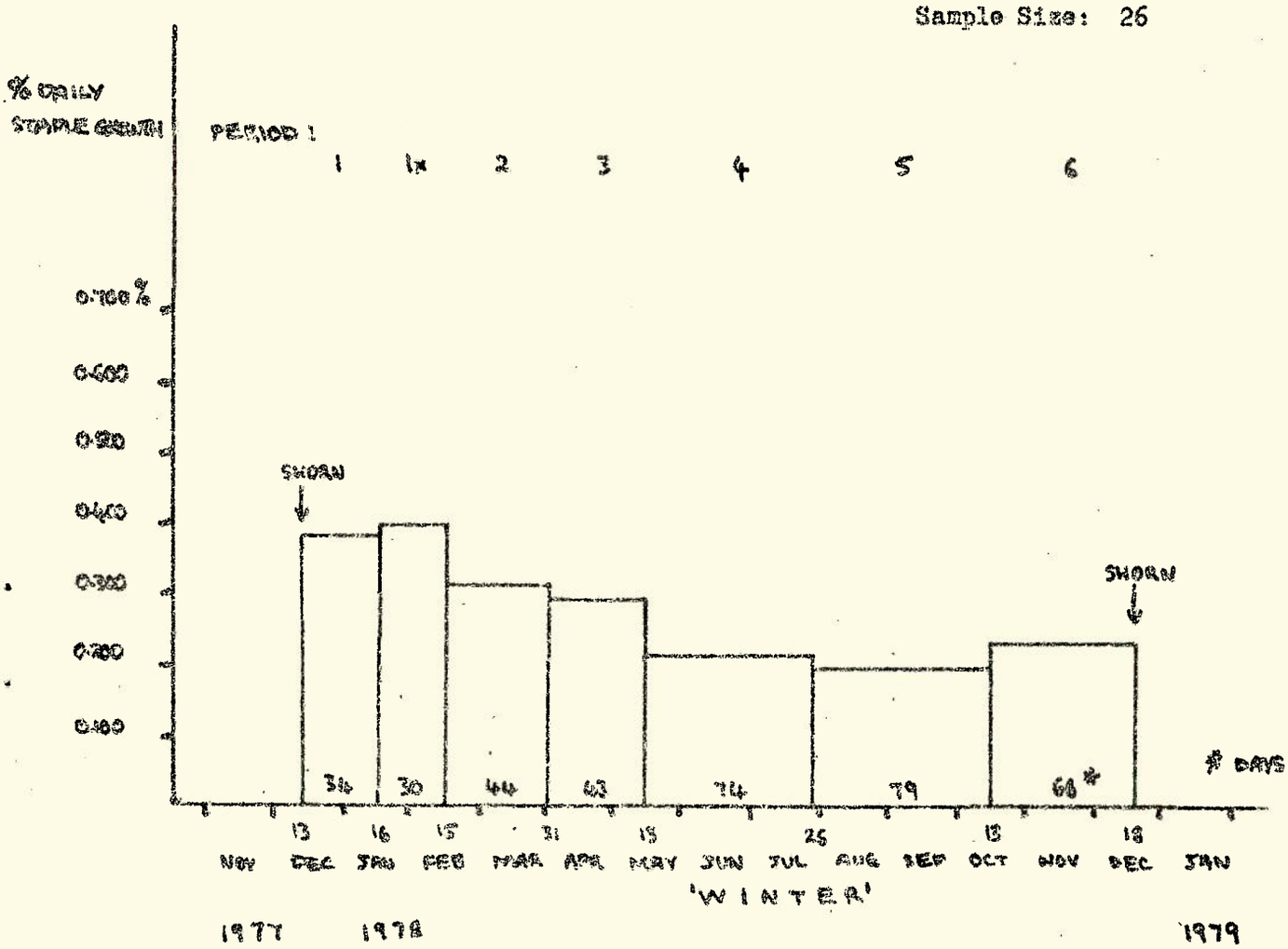


FIG 17: '76 AGE SHEARLING WETHERS (1 SHEAR) SHORN DECEMBER

Sample Size: 26



DATA FROM FYRGS D.S. N.A. (1.3) 78/79

T.P.M. 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - ADULT DRY EWES

Refer to Table 6

FIG 18: '71 AGE DRY EWES (6 SHEAR) SHORN FEBRUARY

Sample Size: 5

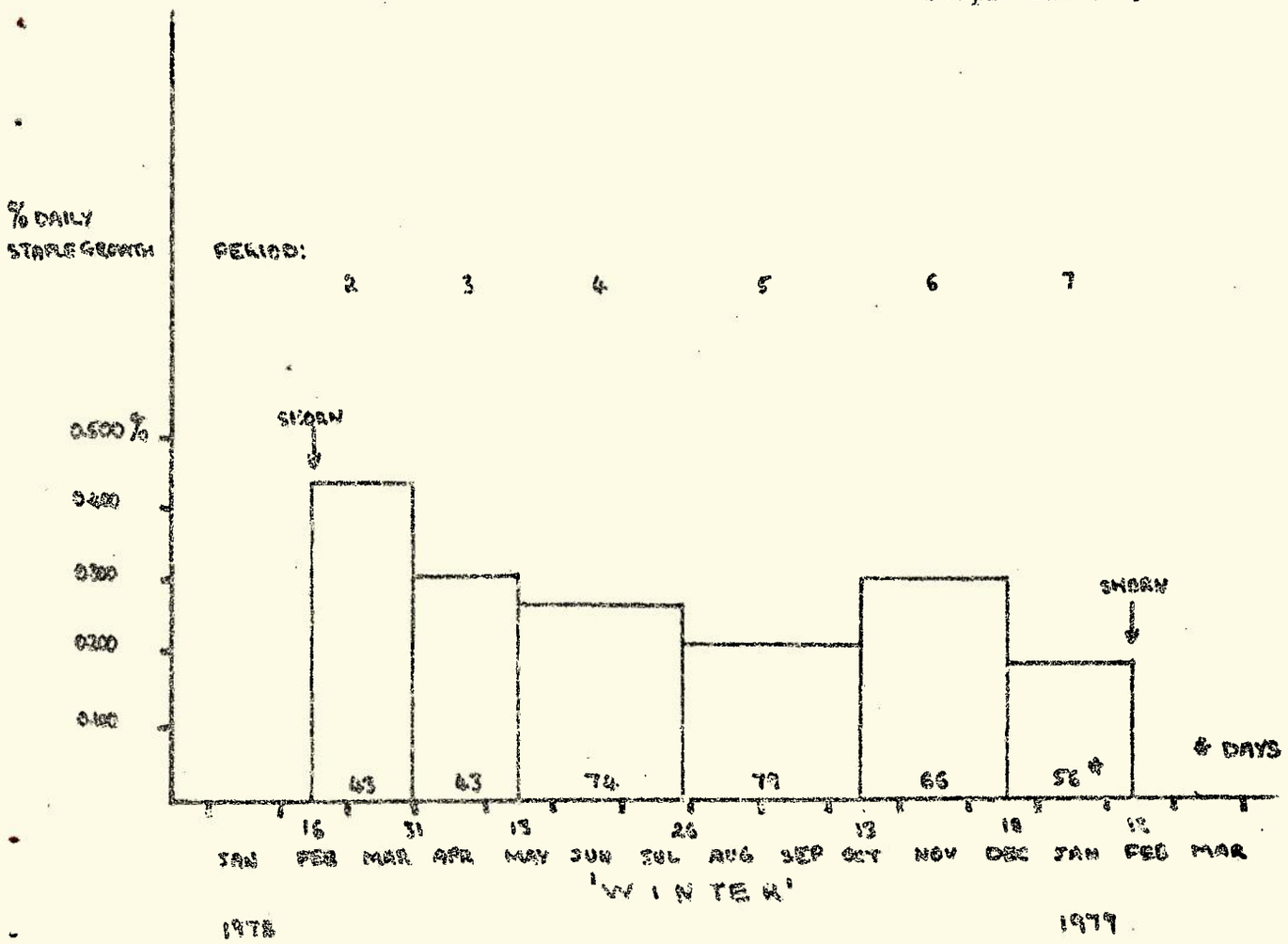
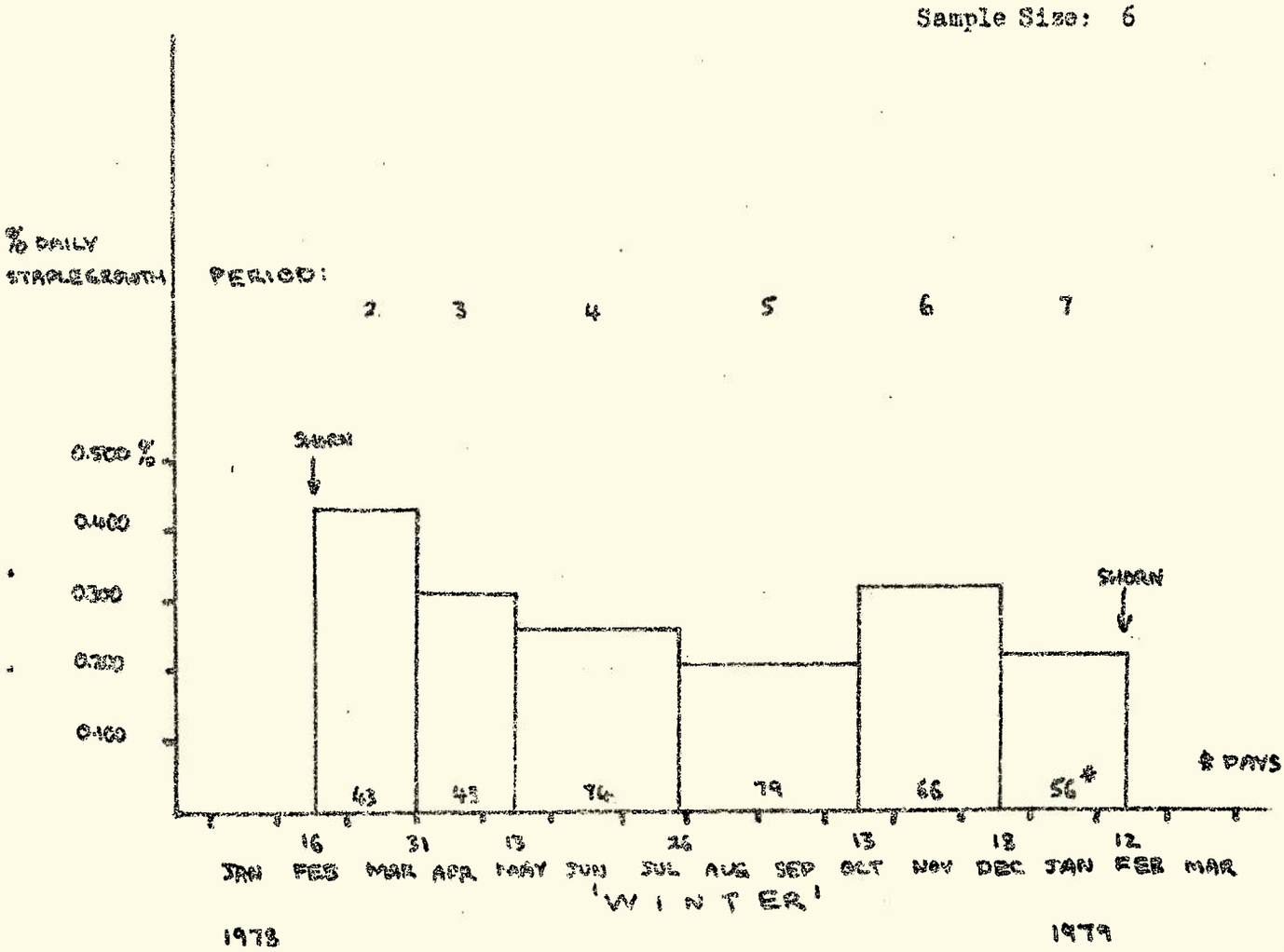


FIG 19: '72 AGE DRY EWES (5 SHEAR) SHORN FEBRUARY

Sample Size: 6



DATA FROM FYRGS D.S. N.A. (1.3) 78/79

T.P.M. 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - ADULT DRY EWES

Refer to Table 6

FIG 20: '73 AGE DRY EWES (4 SHEAR) SHORN FEBRUARY

Sample Size: 7

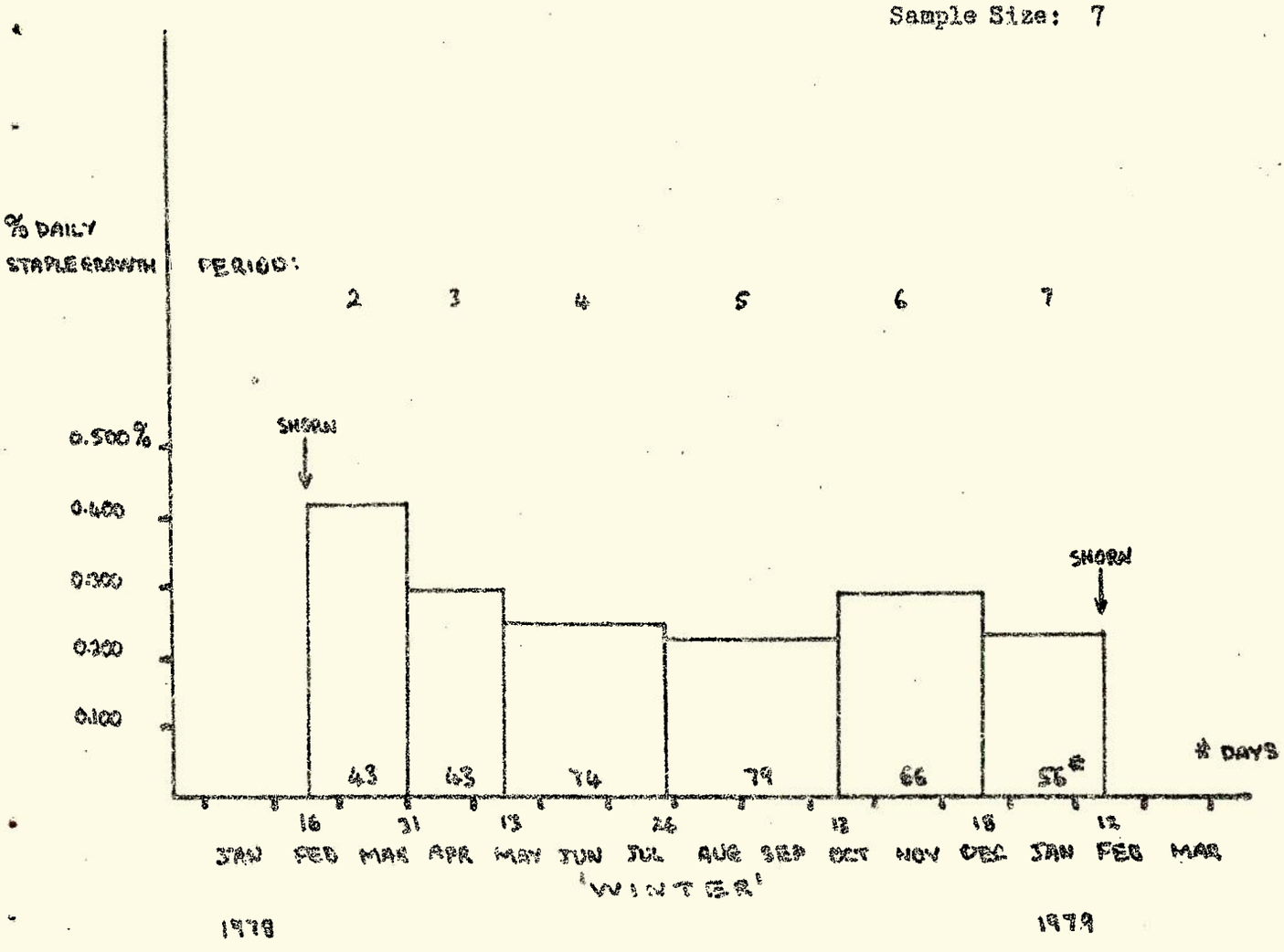
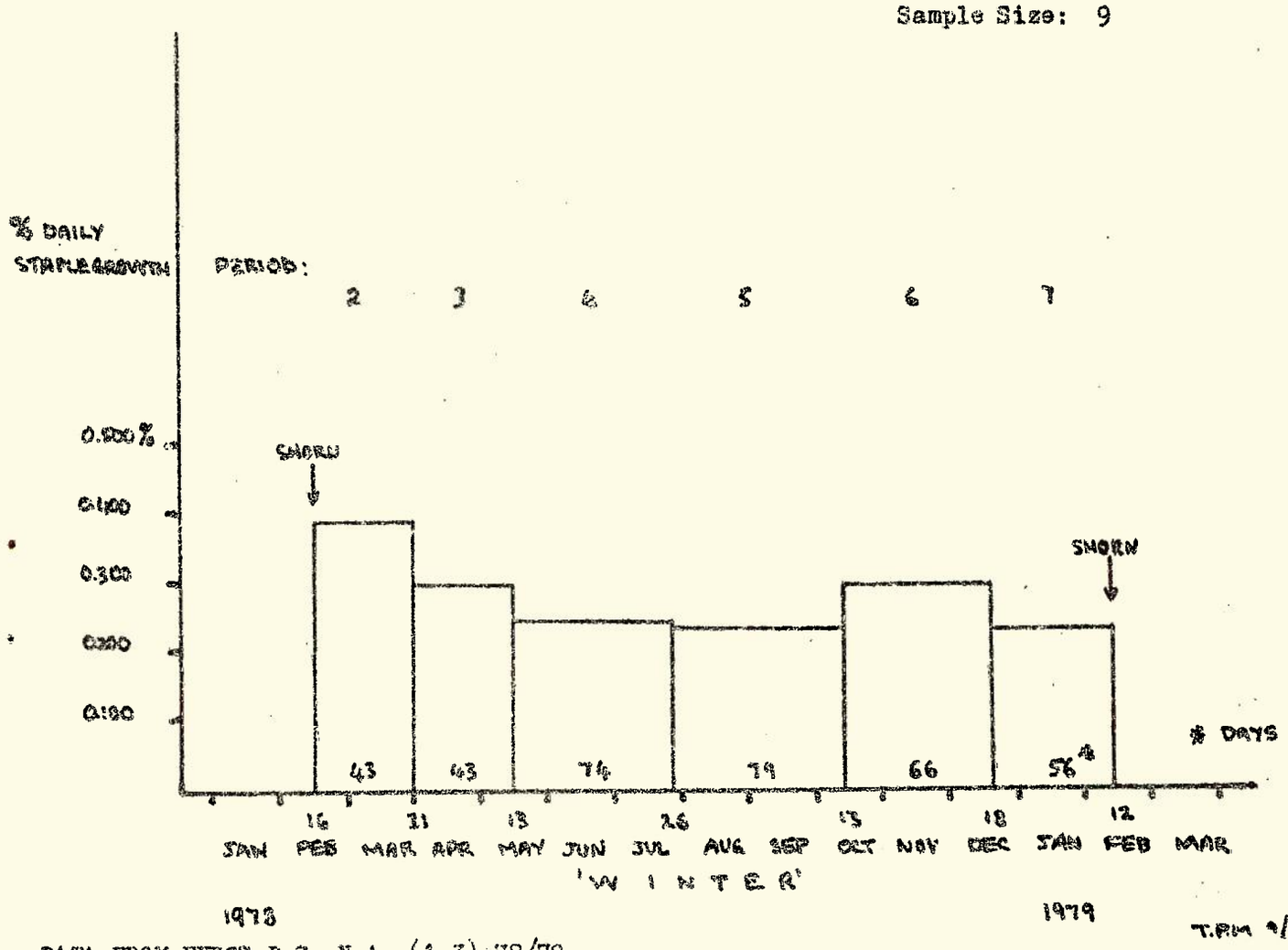


FIG 21: '74 AGE DRY EWES (3 SHEAR) SHORN FEBRUARY

Sample Size: 9



DATA FROM FYRGS D.S. N.A. (1.3) 78/79

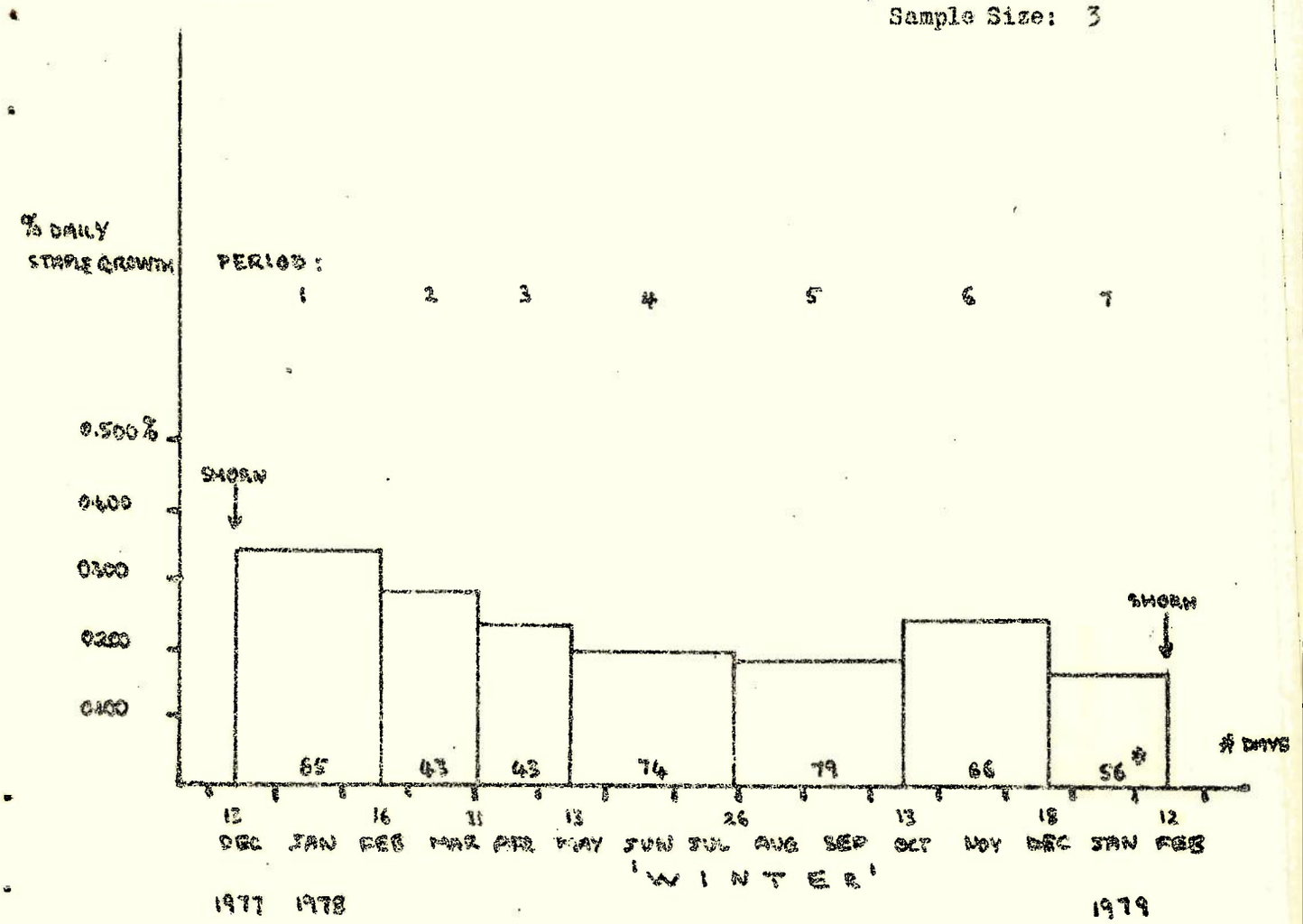
T.RM 9/79

78/79 SEASONAL WOOL GROWTH PATTERN - ADULT DRY EWES

Refer to Table 6

FIG 22: '75 AGE DRY EWES (2 SHEAR) SHORN DECEMBER

Sample Size: 3



DATA FROM FYRGS D.S. N.A. (1.3) 78/79

78/79 SEASONAL WOOL GROWTH PATTERN - ADULT WETHERS

Refer to Table 7

FIG 23: '72 AGE WETHERS (5 SHEAR) SHORN DECEMBER

Sample Size: 3

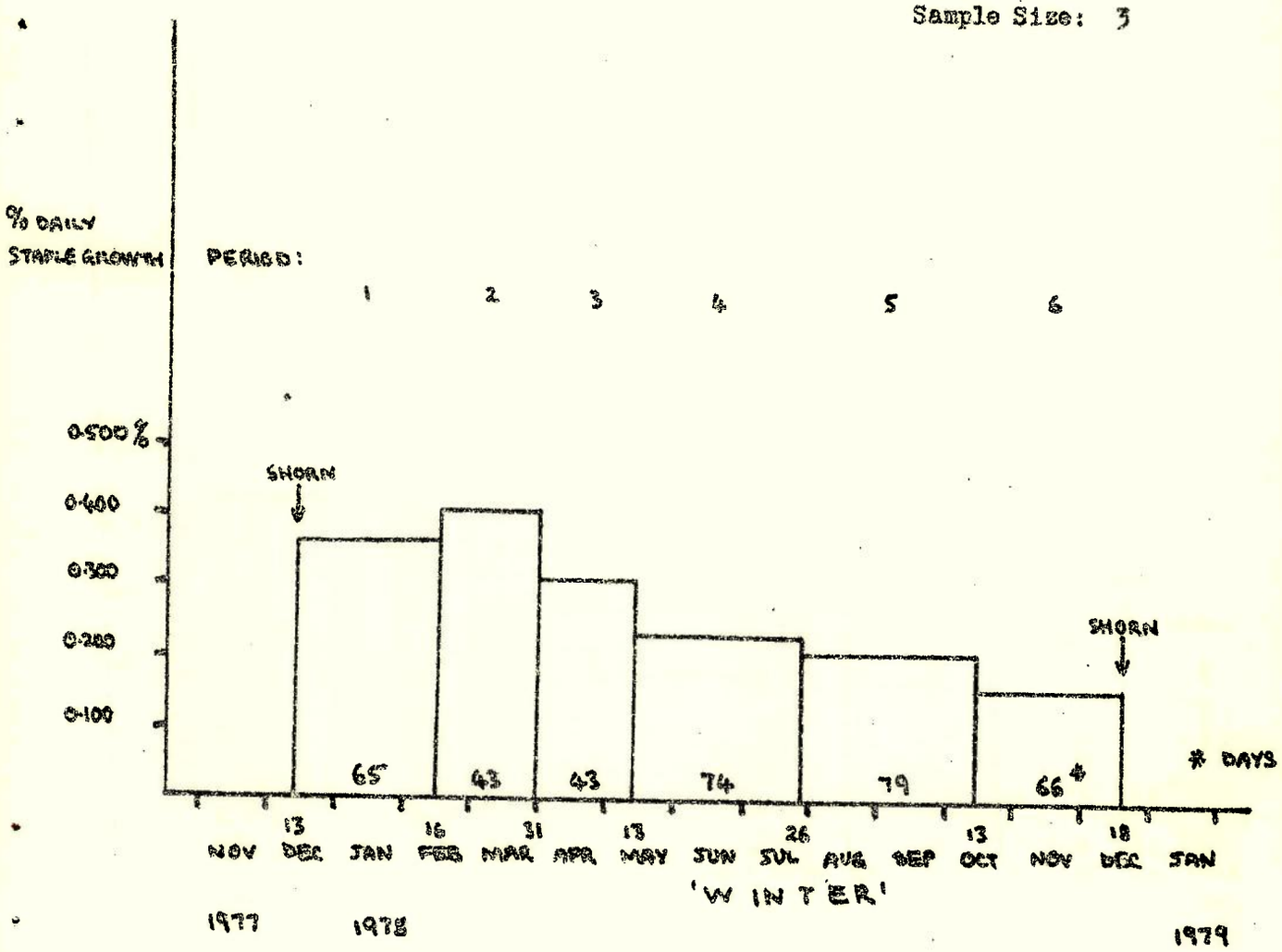
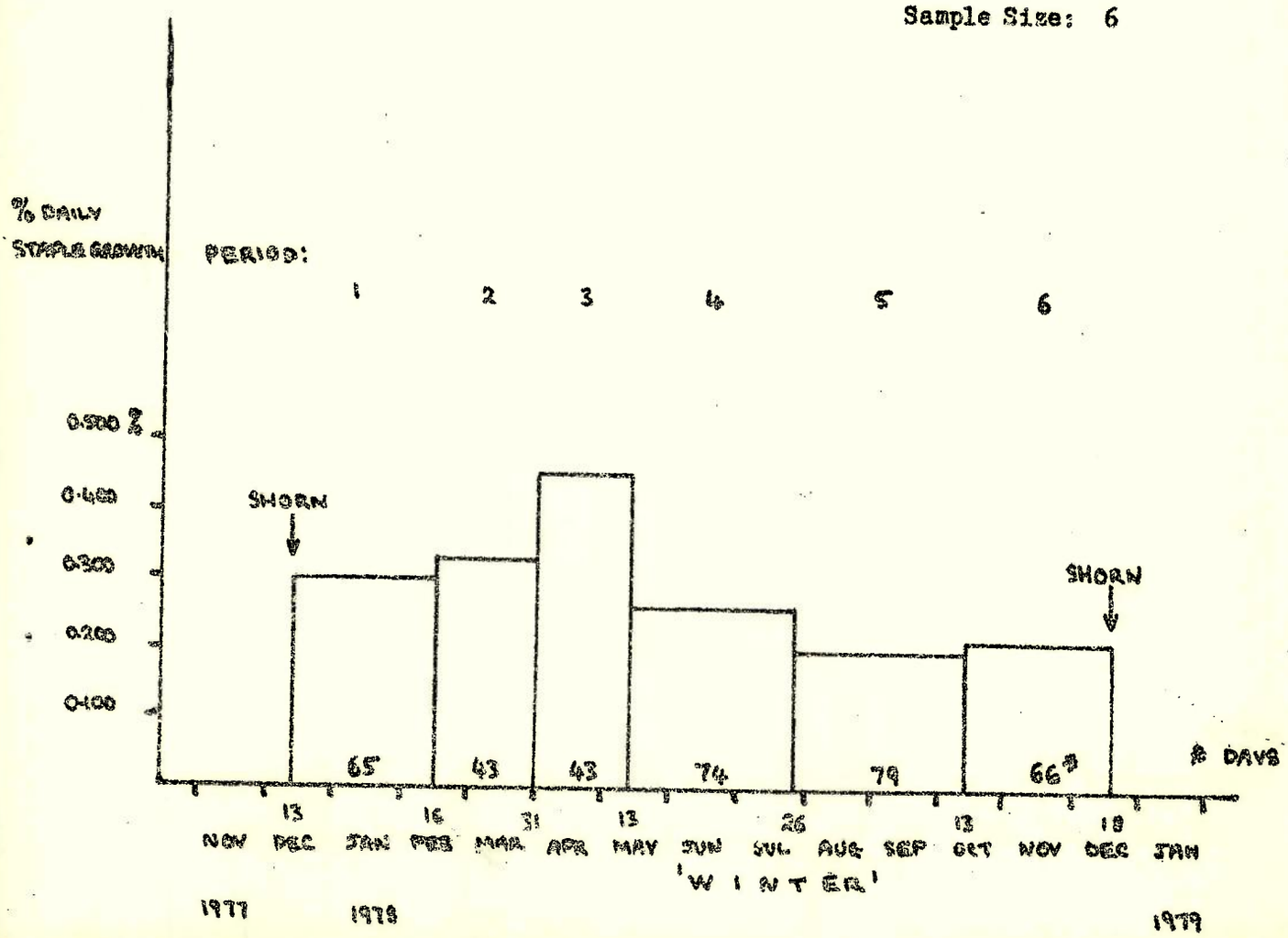
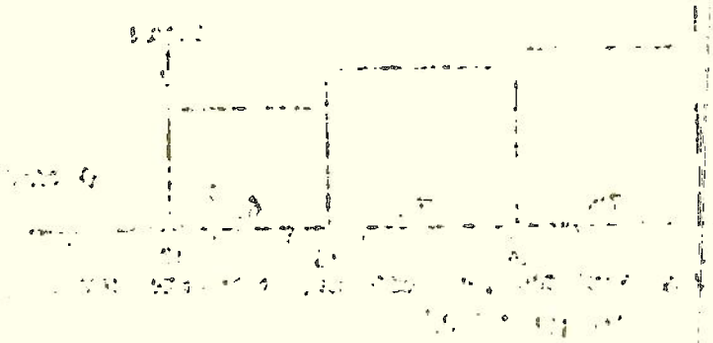


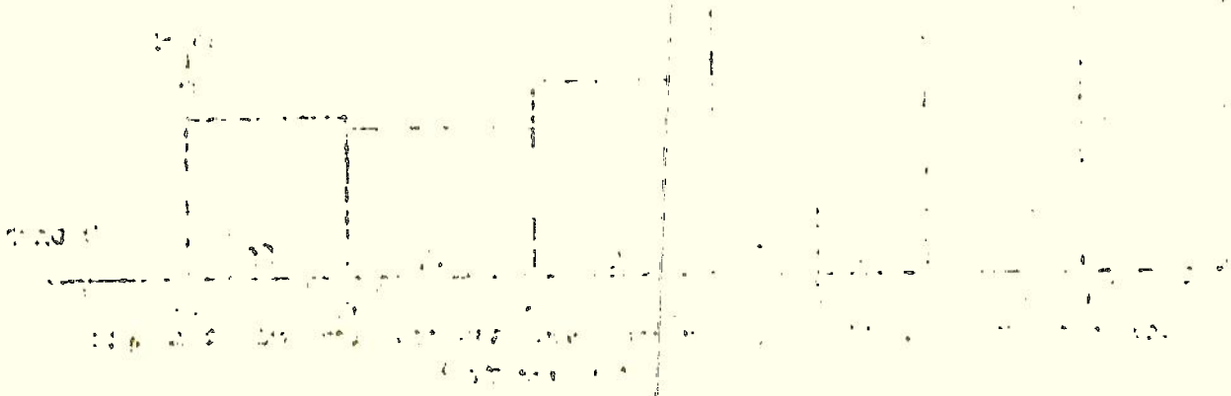
FIG 24: '73 AGE WETHERS (4 SHEAR) SHORN DECEMBER

Sample Size: 6



DATA FROM FYRGS D.S. N.A. (1.3) 78/79





78/79 SEASONAL WOOL GROWTH PATTERN - ADULT WETHERS

Refer to Table 7

FIG 25: '74 AGE WETHERS (3 SHEAR) SHORN DECEMBER

Sample Size: 10

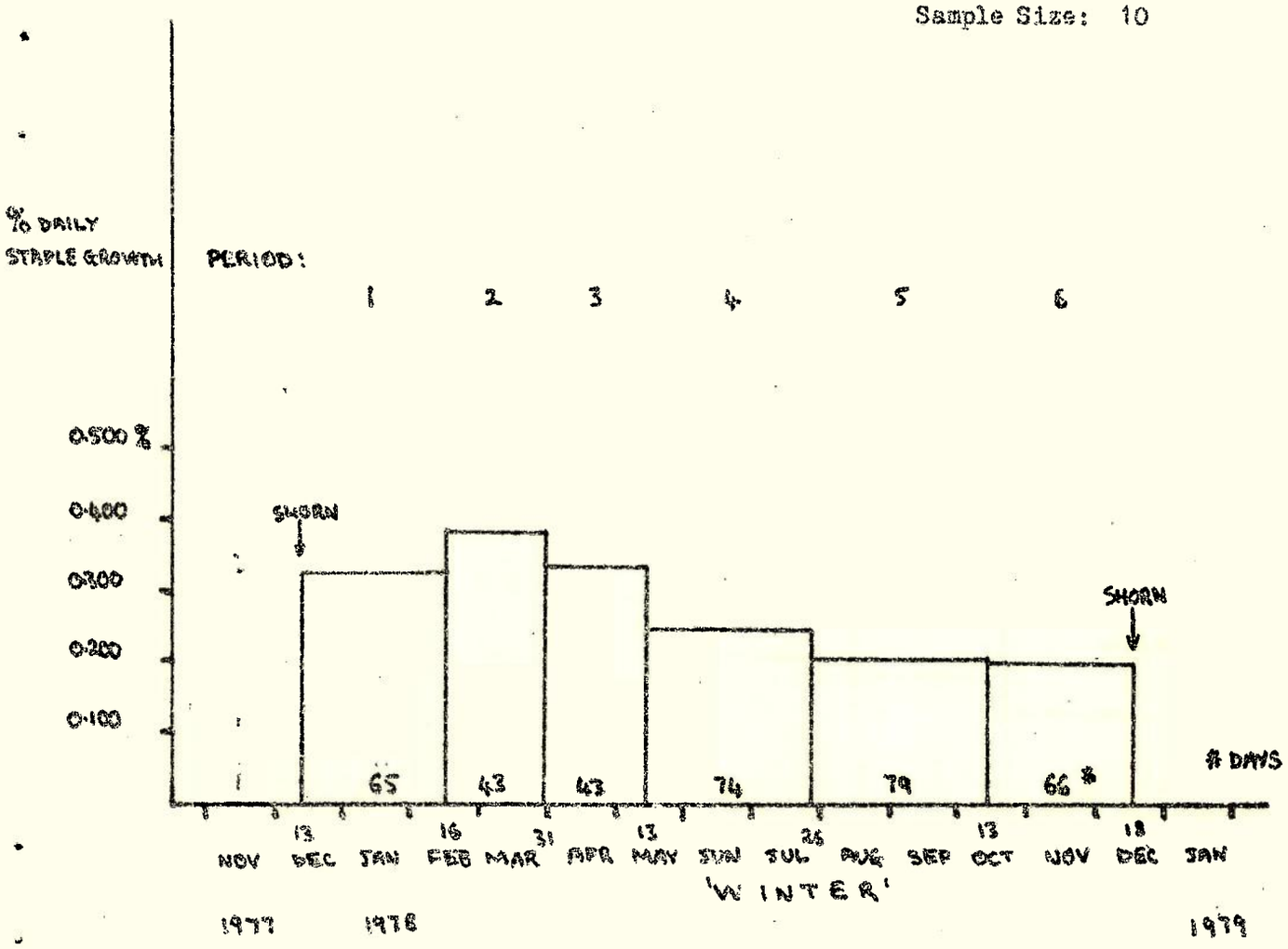
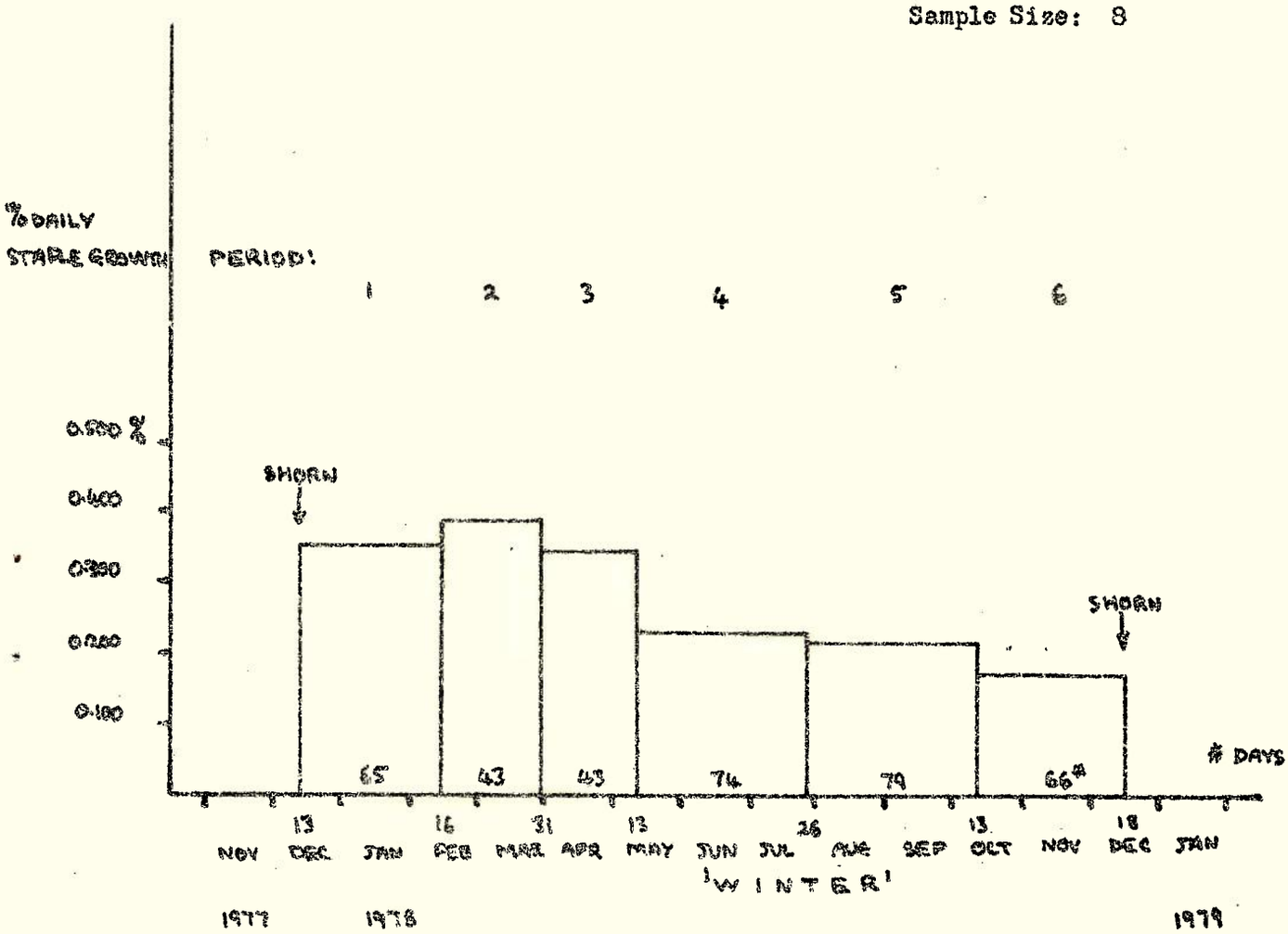


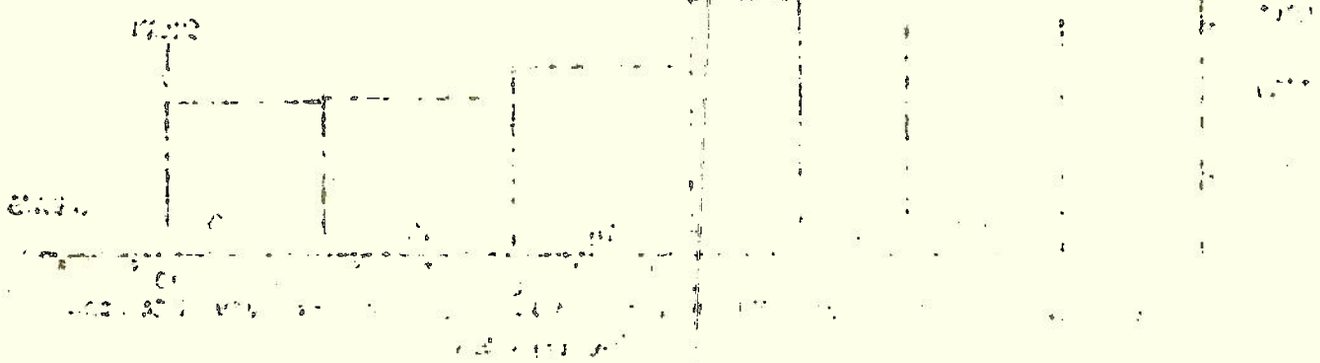
FIG 26: '75 AGE WETHERS (2 SHEAR) SHORN DECEMBER

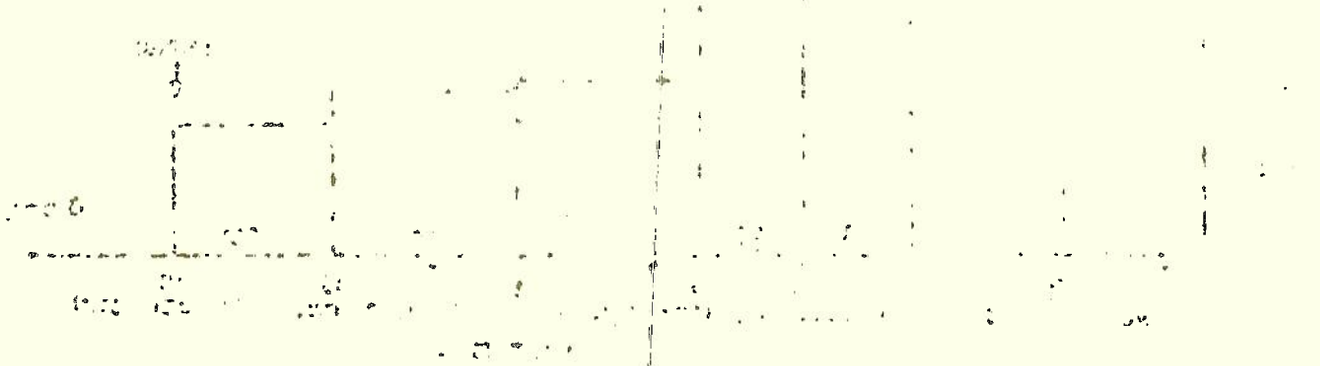
Sample Size: 8



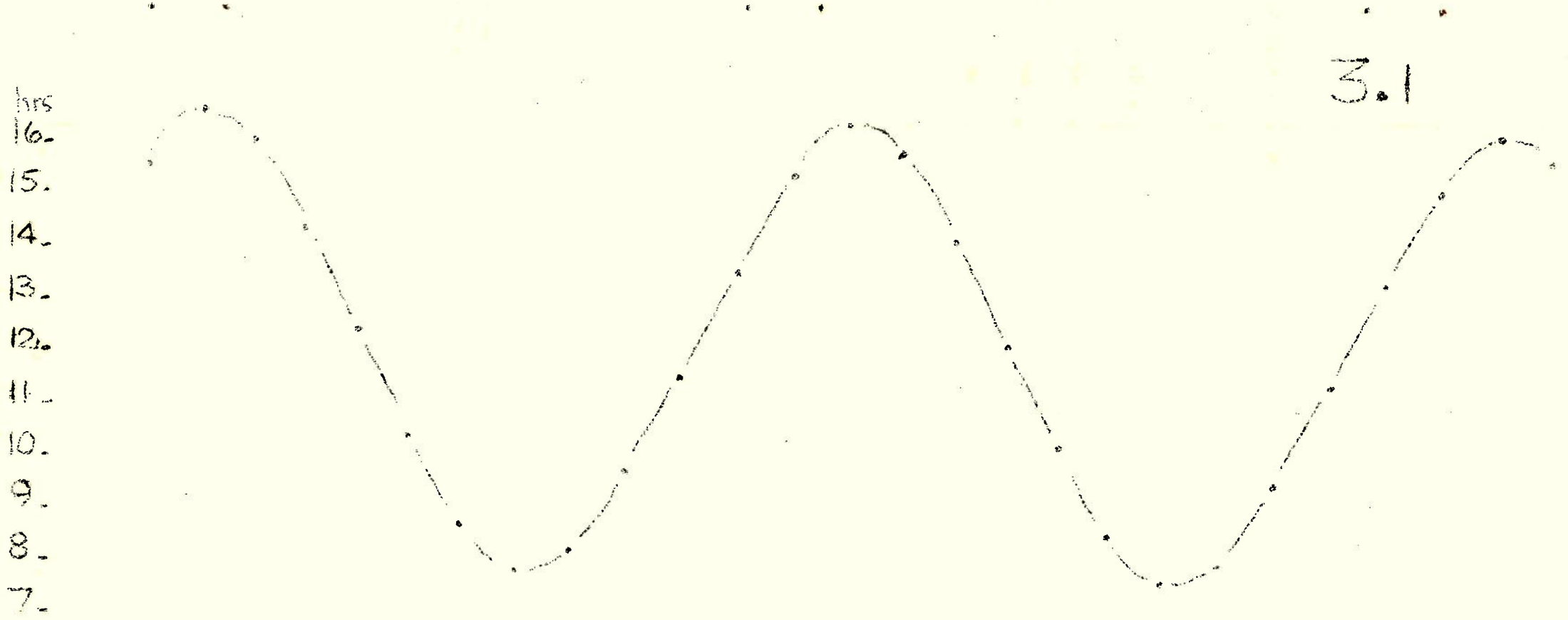
DATA FROM FYRGS D.S. N.A. (1.3) 78/79

T.P.M. 9/79





3.1



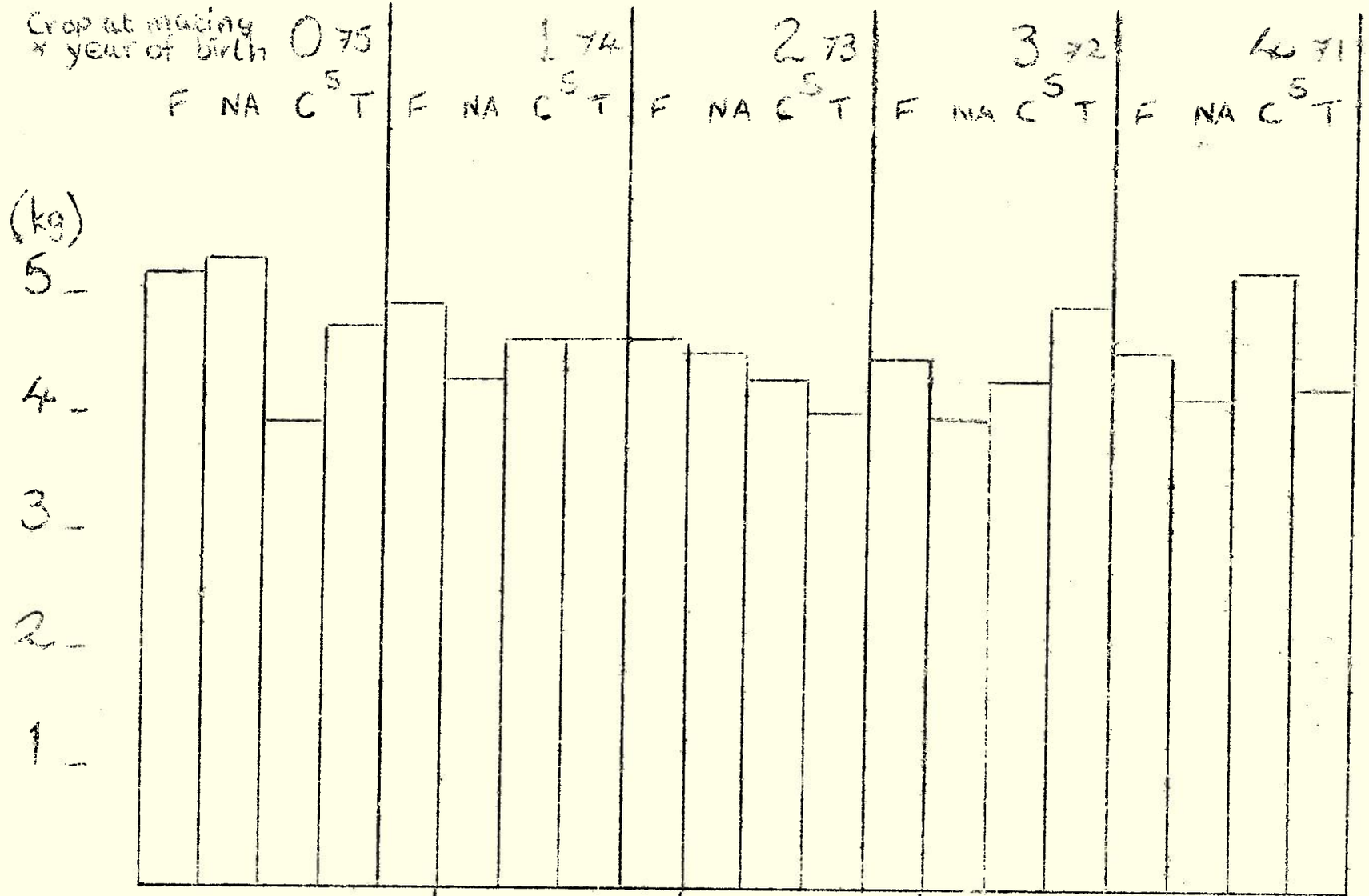
MEAN MONTHLY DAY LENGTH (hrs) PORT STANLEY LAT 51° 42' S

N D J F M A M J J A S O N D J F M A M J J J A S O N D J F M A M J J J A S O N D J F

MEAN GREASY FLEECE WTS X AGE GROUP: EWES 1978/79

F = 1.4 Fitzroy Dry Ewes NA = 1.3 N. Arm Dry Ewes 78/79 3.1

C = 1.1 Salvador and T = 1.1 Salvador ewes having reared a lamb 78/79



3.2 PRE-PARTUM FEEDING EXPERIMENT: FOX BAY EAST

Two small flocks of ewes in five ages are compared, one of which is supplemented by grass cubes made available from five - six weeks prior to lambing commencing at 0.1kg and rising to 0.45kg/per head/day.

Object: To determine the level of nutrition necessary during the pre-partum period to influence the birth weights of lambs.

Treatments: The Control flock is set stocked and not supplemented.

The Treatment flock is set stocked and supplemented six weeks prior to lambing on a rising scale (Russel HFRO 4th Triennial Report).

Method: Details are given in this section.

Results: The results have not as yet been subject to statistical analysis.

	CONTROL		TREATMENT	
	77/78	78/79	77/78	78/79
Mean birth weight	3.3kg	3.6kg	3.6kg	3.8kg
Pre-partum period ewe weight change	+1.2kg	+3.6kg	+4.5kg	+6.3kg

Discussion: Doubtless Dickson (Davies et al 71) would in 1969 have attempted an experiment similar to this had the arrival of the Team been earlier in the year. An attempt however was made to influence lactation and wool growth during and after lambing with inconclusive results, apparently due to similar difficulties in training the animals to accept the supplement.

REF: PPFE (FBE) (3.2) 79/80

PRE-PARTUM FEEDING EXPERIMENT - FOX BAY EAST

SCHEDULE OF WORK 1979/80

WT	PROVISIONAL DATE	DAY NO.	ACTIVITIES	FLOCK	GRAZING
1	2/5/79	2	Weigh, condition score and dye band all C & T ewes Commence mating (2 rams per flock required)	C & T	N
2	15/6/79	46	Weigh, condition score and dye band all C & T ewes Remove all rams	C & T	N
3	17/8/79	109	Weigh, condition score and dye band all C & T ewes Commence feeding T ewes	C T	N S
4	28/9/79	151	Weigh, condition score and dye band all C & T ewes Lambing commences with detailed recording	C T	N S
5	16/11/79	200	Weigh, condition score and dye band all C & T ewes Weigh all lambs	C & T	N
5X	*/12/79	*	*Weigh and condition score all C & T ewes Weigh all lambs	C & T	N
6	31/1/80	276	Weigh and condition score all C & T ewes Shear all C & T ewes, recording wool weights Recover dye banding samples Cull and cast ewes removed Select, tag, weigh and condition score replacement maiden ewes Dye band all shorn ewes and maidens Weigh all lambs Mark and wean all lambs	C & T	N
7	31/3/80	335	Weigh, condition score and dye band all C & T ewes	C & T	N

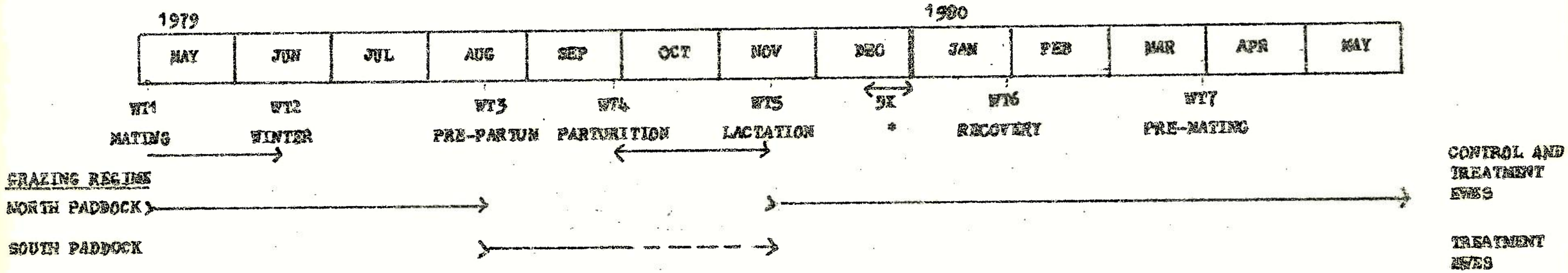
* Additional weighing especially lambs - mid/late December if time permits

All dates are provisional to take account of holidays, travel delays etc.

Control ewes are referred to as C
Treatment ewes are referred to as T

Paddocks: N North Paddock
S South Paddock

CALENDAR AND GRAZING REGIME 1979/80



T.P.M. 6/79

PRE-PARTUM FEEDING EXPERIMENT : FOX DAY EAST 1977/78

CONTROL

YEAR OF BIRTH	SAMPLE NO.	LAMB CROP AT MATING	PRE-MATE LIVE WT(kg)	FEED PERIOD WT CHANGE	LAMBING PERIOD WT CHANGE	MEAN BIRTH WT	LAMBING PERCENTAGE	M WEAN WT	WEAN PERCENTAGE	FLEECE WT(kg)
69	9	5	43.8	-0.2	-0.9	2.9	56	17.0	44	2.0
70	9	4	44.1	+1.6	-3.0	3.4	78	16.4	67	3.1
71	10	3	41.3	+1.0	-1.5	3.8	60	19.0	40	3.1
72	11	2	43.2	+2.6	-3.9	3.1	91	20.5	91	3.2
73	10	1	43.4	+0.8	-2.7	3.4	70	18.7	40	3.5
Adult age-groups Mean			43.2	+1.2	-2.4	3.3	72	18.3	56	3.2
74	10	0	36.6	+2.0	-0.7	3.0	40	16.7	30	3.8
	59									

Lambs born 66% Lambs weaned 62%

TREATMENT

69	9	5	47.7	+5.9	-1.9	3.4	67	18.2	67	3.1
70	8	4	41.5	+4.3	-1.3	3.5	62.5	17.8	62.5	2.7
71	8	3	38.4	+2.6	-2.6	3.8	75	17.6	50	3.0
72	11	2	43.5	+4.6	-3.9	3.7	100	21.4	73	3.2
73	10	1	42.7	+5.2	-3.0	3.6	100	21.9	100	3.2
Adult age-groups Mean			42.8	+4.5	-2.6	3.6	81	19.4	70.5	3.2
74	6	0	38.0	+4.9	-4.2	3.5	83	15.5	67	3.2
	52									

Lambs born 80.8% Lambs weaned 69%

PRE-PARTUM FEEDING EXPERIMENT : FOX BAY EAST 1978/79

CONTROL

YEAR OF BIRTH	SAMPLE NO.	LAMB CROP AT MATING	PRE-MATE LIVE WT(kg)	FEED PERIOD WT CHANGE	LAMBING PERIOD WT CHANGE	MEAN BIRTH WT	LAMBING PERCENTAGE	M WEAN WT	WEAN PERCENTAGE	FLEECE WT(kg)
70	10	5	43.1	+4.4	-4.9	3.9	80	15.7	80	2.7
71	10	4	44.0	+3.2	-6.9	3.2	120	15.0	90	2.8
72	11	3	45.1	+3.2	-4.7	3.9	91	20.5	82	3.0
73	10	2	46.1	+3.3	-8.2	3.6	90	17.3	50	3.2
74	10	1	40.6	+4.1	-4.0	3.4	80	17.1	80	3.0
Adult age-groups Mean			43.8	+3.6	-5.8	3.6	94	17.1	76	2.9
75	10/61	0	40.2	+1.7	-2.9	3.3	80	16.7	80	3.3

Lambs born 94% Lambs weaned 80%

TREATMENT

70	8	5	48.9	+6.3	-1.7	3.9	100	17.7	62.5	2.75
71	8	4	45.4	+6.8	-4.3	4.0	75	18.4	75	2.9
72	11	3	44.7	+6.3	-6.0	3.7	109	18.9	100	2.9
73	9	2	46.4	+6.1	-4.6	3.75	89	21.9	89	3.4
74	8	1	40.4	+6.2	-2.2	3.6	50	19.6	50	3.1
Adult age-groups Mean			45.2	+6.3	-3.0	3.8	85	19.3	75	3.0
75	7/49	0	42.6	+4.3	-5.2	3.2	100	17.9	80	3.7

Lambs born 88% Lambs weaned 75%

APPENDIX 3.5 (A)

MATING PERFORMANCE SALVADOR. 1977, 1978

	FLOCK AGE	CONTROL			TREATMENT		
		Maidens	Adults	Total	Maidens	Adults	Total
Percentage of ewes served in the first 17 days of mating which lambed	1977	92	96	95	91	99	98
	1978	97	97	97	78	91	89
Percentage of ewes which repeated and which lambed	1977	67	81	77	57	87	68
	1978	100	79	84	43	82	70

OVULATION RATE OF BREEDING EWES AT NORTH ARM 1978

Summary

An investigation at North Arm between April and August 1978 to observe the pattern of ovulation in 3 ages of ewes during the period when such sheep are most likely to be mated and to obtain details of their body weight changes, carcase weights, killing out percentages and chest depths.

Unfortunately, two rams broke into the ewe flock and successfully mated with at least 33 ewes thus making accurate interpretation of the results difficult.

The overall pattern was one of maintenance of body weight until July when a sharp decrease ocurred. Ovulation rate peaked at about 130% in late May and thereafter steadily decreased and the incidence of anoestrus increased from 0% in early July up to 66% in August at the end of the investigation.

The Grasslands Trials Unit original date for the onset of mating in their flocks would overlap with this period of rising incidence of anoestrus.

It is shown that maiden ewes at $2\frac{1}{2}$ years of age have not reached their mature body weight. Overall the mature ewes on this farm had a carcase weight of approximately 18kg, and chest depth of 28cm and a killing out percentage of 44%.

Object

A small pilot study in 1977 in which farms were requested to collect ewes uteri and ovaries for subsequent examination, indicated an ovulation rate of about 130%. Unfortunately the method of this study was such that little credence can be given to that value as an accurate indicator of the real situation.

The object of this investigation was to observe the pattern of ovulation rate in 3 ages of ewes during the period when they are most likely to be mated to obtain details of their mean body weight changes, carcase weights, chest depth and killing out percentages.

Method

From a flock of ewes culled for wool or conformation faults 6 groups were formed composed of one group of 67 and one group of 16 from each of the maiden, 1-crop and 2-crop ewes born in 1975, 1974 and 1973 respectively, each sheep having a random chance of being allotted to either group within the age groups.

The three groups of 16 sheep were run in a small camp near the settlement and were weighed each Monday morning to obtain details of weight change patterns with the season.

The three groups of 67 sheep were run together in a separate camp. The original intention was to withdraw 10 ewes each week, randomly selected, so that 3 each of two age groups and 4 ewes of the other would be slaughtered each Monday. In the event, however, 20 ewes were withdrawn with 10 being slaughtered and the remaining 10 being held for the next week's killing.

Prior to slaughter the ewes' body weights and chest depth (at maximum size) were recorded. After slaughter, the carcase weight (dressed carcase with head and kidneys) was recorded and the uterus and ovaries from each ewe stored in 10% formaldehyde solution for later examination.

The ovaries were examined by dissection and the most recent event in the cycle of ovarian function - adjudged purely by details of the corpora lutea - was recorded. No measurements were made to estimate the age of the corpora lutea. A brief examination of the uterus was made.

Results and Discussion

The results are confused by the fact that two rams were found in the slaughter group on 15th May and, although it is not known for how long they had been in with the ewes, it is thought that it was probably not more than 14 days. Nevertheless as can be seen from Table 1, a total of 33 ewes are known to have been mated and held to the service by these rams, representing 24.2%, 15.4% and 10.8% of the ewes available in the 2-, 1-, and 0-crop groups respectively. (The disparity between the original 67 ewes in each group was due to the unidentified presence of some wethers).

The ewes which are known to have been in lamb were deleted from all calculations leaving 50, 55 and 58 in the 2-, 1- and 0-crop groups respectively.

The mean weights of all these ewes on 1st April 1978 is shown in Table 1 and may be compared with the mean weights of the 16 ewes weighed every week (shown in Table 2):-

Mean Weight on 1st April 1978

	0-crop	1-crop	2-crop
Weighed groups of 16	36.8kg	43.4kg	44.7kg
Remainder of groups of 67	33.6kg	40.2kg	40.6kg

Although the smaller groups appear to have had a higher mean weight at the outset of the investigation, the high coefficients of variation of these values indicate that the two samples are most probably from the same population in each age group.

The progress of the groups which were weighed every week is shown in Table 2 and in Figure 1. It is apparent that not only are the mean body weights of the 3 age groups in a distinct scale but also the coefficients of variation (CV) of these body weights are in a scale with the younger age group having the lowest CV. Although some of the variation in mean body weight is due to the sheep being weighed when their fleeces were wet (on 17th April, 1st May, 3rd, 10th & 17th July), the overall trend is a sharp decrease in body weight at the beginning of July onwards. Examination of the meteorological data from Stanley (not shown) gives no easy explanation and this decrease in body weight is probably a function of the combination of cold wet weather and advancing winter period. The disparity in mean body weights of the maiden ewes and the other ages must be taken as signifying incomplete maturity of the youngest age group.

The mean change in body weight of the ewes slaughtered each week as compared to their body weights on 1st April is shown in Figure 2. The values are those for all the slaughtered sheep together are not separated into age groups due to the deletion of pregnant ewes making the groups killed each week too small. The overall picture is much the same as that shown by the weekly weighings of the smaller groups (Figure 1) indicating that the samples of each group slaughtered each week could be regarded as being representative of the flock situation.

Turning to the percentage of corpora lutea per ewe, and the percentage of ewes recorded as being in anoestrus, shown in Figure 2 with details in Table 3, it can be seen that the ovulation rate (judged by presence or absence of corpora lutea of similar sizes) appears to peak in middle-end of May with a distinct tail-off in July. Obviously a compounding influence on this pattern was the presence of 2 rams detected on 15th May which also happens to be the day of highest recorded ovulation rate. What influence these rams may have had on ovulation rate may only by surmised but it is possible that after an initial stimulation, there was a secondary depression, 5th, 12th & 19th June following the ram's removal.

The ewes were regarded as being in anoestrus if nether of their ovaries showed signs of recent function in terms of presence of corpora lutea or follicles. Whilst this method of classification may be up to 18 days behind "schedule" (the assumed period of death of a corpus luteum), it does give a picture of the flock situation.

The Grasslands Trials Unit's flock at Brenton Loch and Ronda were first mated (in 1976) on 21st June (midwinter) which means that some of the ewes (assuming those two flocks to be similar to the North Arm flock) would come into a mateable season for the first time during the period when the incidence of anoestrus was increasing. The two trial flocks are now mated starting on 5th June but this is still dangerously near the beginning of the anoestrus period. These details, however, should be treated with some caution because of the devastation wrought by the two rams.

Further details of the ewes physiology are shown in Table 1 with the mean carcase weights of approximately 16 and 19 kilograms and chest depths of 26 and 28 centimetres for maiden and 'adult' ewes respectively with a killing out percentage of approximately 44% for all ages.

Acknowledgements The staff of North Arm, in particular Mr. Nigel Knight are to be thanked for recording the data and collection of the samples and Mr. Tony Blake for making the sheep available.

R. S. Whitley
June 1979

Circulation: All farms and interested bodies
ODM
N. Knight

TABLE 1

Summary of details of ewes which were slaughtered at North Arm between April and August 1978

	Ewes born 1975 (maidens)	Ewes born 1974 (1-crop)	Ewes born 1973 (2-crop)
Number involved	58	55	50
Mean weight at start kg ± 1SD	33.6 ± 5.8	40.2 ± 7.3	40.6 ± 4.6
Mean carcase weight (1) kg ± 1SD	16.0 ± 2.2	18.7 ± 3.1	18.9 ± 2.3
Mean killing out percentage (3) % ± 1SD	43.3 ± 3.3	44.8 ± 2.9	44.1 ± 3.3
Mean chest depth (2) cm ± 1SD	26.4 ± 1.2	28.0 ± 1.9	28.5 ± 1.5
Number which got in lamb by mistake	7	10	16
Percentage of ewes available	10.8%	15.4%	24.2%

(1) Carcase weight was measured as dressed carcase with head and kidneys.

(2) Chest depth was measured at greatest value on live animal.

(3) Killing out percentage calculated from

$$\frac{\text{Carcase weight}}{\text{Body weight prior to slaughter}} \times 100$$

TABLE 2

Mean body weights, standard deviation and coefficient of variation of 16 ewes in each of 3 different age groups at North Arm from April to August 1978

DATE		1.4	10.4	17.4	24.4	1.5	8.5	15.5	22.5	29.5	5.6	12.6
Ewes born 1973 entering 3rd breeding season	Mean body weight kgs	44.7	44.8	47.2	45.2	48.0	47.3	47.3	48.1	47.0	46.5	46.9
	Standard deviation kgs	4.9	4.5	4.6	4.4	4.8	4.5	4.8	4.3	4.7	4.4	4.4
	Coefficient of variation %	11	10	10	10	10	10	10	9	10	10	9
Ewes born 1974 entering 2nd breeding season	Mean body weight kgs	43.4	45.1	46.7	44.3	47.2	46.2	46.9	47.1	46.5	46.2	46.5
	Standard deviation kgs	4.2	4.6	3.3	3.7	3.3	3.5	3.4	3.1	3.7	3.4	3.5
	Coefficient of variation %	10	10	8	8	7	7	7	7	8	7	8
Ewes born 1975 entering 1st breeding season	Mean body weight kgs	36.8	38.7	40.0	38.3	41.0	40.3	40.8	41.2	40.7	40.2	39.9
	Standard deviation kgs	3.0	4.0	3.4	3.0	3.1	3.3	2.9	2.9	2.7	2.7	2.8
	Coefficient of variation %	8	10	9	9	8	8	7	7	7	7	7

CONTINUED BELOW

CONTINUED FROM ABOVE

DATE		19.6	26.6	3.7	10.7	17.7	24.7	31.7	7.8	14.8	21.8
Ewes born 1973 entering 3rd breeding season	Mean body weight kgs	47.0	47.3	47.1	47.8	44.8	42.9	42.5	41.3	40.8	40.1
	Standard deviation kgs	4.3	4.1	4.7	4.4	4.3	4.3	4.2	4.4	4.1	4.0
	Coefficient of variation %	9	9	10	9	10	10	10	11	10	10
Ewes born 1974 entering 2nd breeding season	Mean body weight kgs	46.4	46.5	46.5	47.4	44.0	42.0	41.6	40.7	39.6	38.3
	Standard deviation kgs	3.6	3.4	3.9	3.9	3.9	3.4	3.9	4.3	3.9	3.5
	Coefficient of variation %	8	7	8	8	9	8	9	10	10	9
Ewes born 1975 entering 1st breeding season	Mean body weight kgs	40.4	41.2	40.7	41.9	38.3	36.5	36.9	34.6	34.9	34.5
	Standard deviation kgs	2.7	2.8	2.2	2.4	1.9	2.6	2.5	2.0	2.1	1.9
	Coefficient of variation %	7	7	5	6	5	7	7	6	6	6

TABLE 3

Details of weekly totals of Corpora Lutea and sheep present with the percentage of Corpora Lutea per ewe and numbers of sheep in anoestrus

		DATE	10.4	17.4	24.4	1.5	8.5	15.5	22.5	29.5	5.6	12.6
		WEIGHT NO.	2	3	4	5	6	7	8	9	10	11
	CORPORA LUTEA PRESENT	2-CROP	1	3	3	3	3	7	3	3	3	3
		1-CROP	4	4	4	2	4	4	4	5	3	3
		0-CROP	3	2	3	4	3	4	4	5	3	3
		TOTAL	8	9	10	9	10	15	11	13	9	9
	SHEEP RELEVANT	2-CROP	3	3	4	3	3	4	3	3	3	3
		1-CROP	3	4	3	2	4	3	3	4	3	3
		0-CROP	4	3	3	4	3	3	4	3	3	4
		TOTAL	10	10	10	9	10	10	10	10	9	10
	PERCENTAGE CL PER EWE	2-CROP	33	100	75	100	100	175	100	100	100	100
		1-CROP	133	100	133	100	100	133	133	125	100	100
		0-CROP	75	66	100	100	100	133	100	166	100	75
		TOTAL	80	90	100	100	100	150	110	130	100	90

CONTINUED FROM ABOVE

		DATE	19.6	26.6	3.7	10.7	17.7	24.7	31.7	7.8	14.8	21.8
		WEIGHT NO.	12	13	14	15	16	17	18	19	20	21
	CORPORA LUTEA PRESENT	2-CROP	3	3	2	2	3	1	1	0	0	1
		1-CROP	3	2	1	3	2	3	4	0	1	1
		0-CROP	1	3	3	2	0	4	2	2	1	0
		TOTAL	7	8	6	7	5	8	7	2	2	2
	SHEEP RELEVANT	2-CROP	3	3	2	2	2	1	1	1	2	3
		1-CROP	3	2	1	3	3	3	4	0	3	2
		0-CROP	2	2	3	2	1	4	3	2	4	1
		TOTAL	8	7	6	7	6	8	8	3	9	6
	PERCENTAGE CL PER EWE	2-CROP	100	100	100	100	150	100	100	0	0	33
		1-CROP	100	100	100	100	66	100	100	0	33	50
		0-CROP	50	150	100	100	0	100	66	100	25	0
		TOTAL	88	114	100	100	83	100	88	66	22	33
	SHEEP CONSIDERED IN ANOESTRUS	2-CROP								1	1	2
		1-CROP					1				2	1
		0-CROP					1		1		3	1
		TOTAL					2		1	1	6	4

CONTINUED BELOW

FIGURE 2

MEAN BODY WEIGHT CHANGE OF EWES SHORN/MATED EACH WEEK FROM APRIL TO AUGUST, THE PERCENTAGE CORPORA LUTEA PER EWE AND PERCENTAGE EWES RECORDED IN ANOESTRUS.

R = 2 RAMS FOUND IN FLOCK

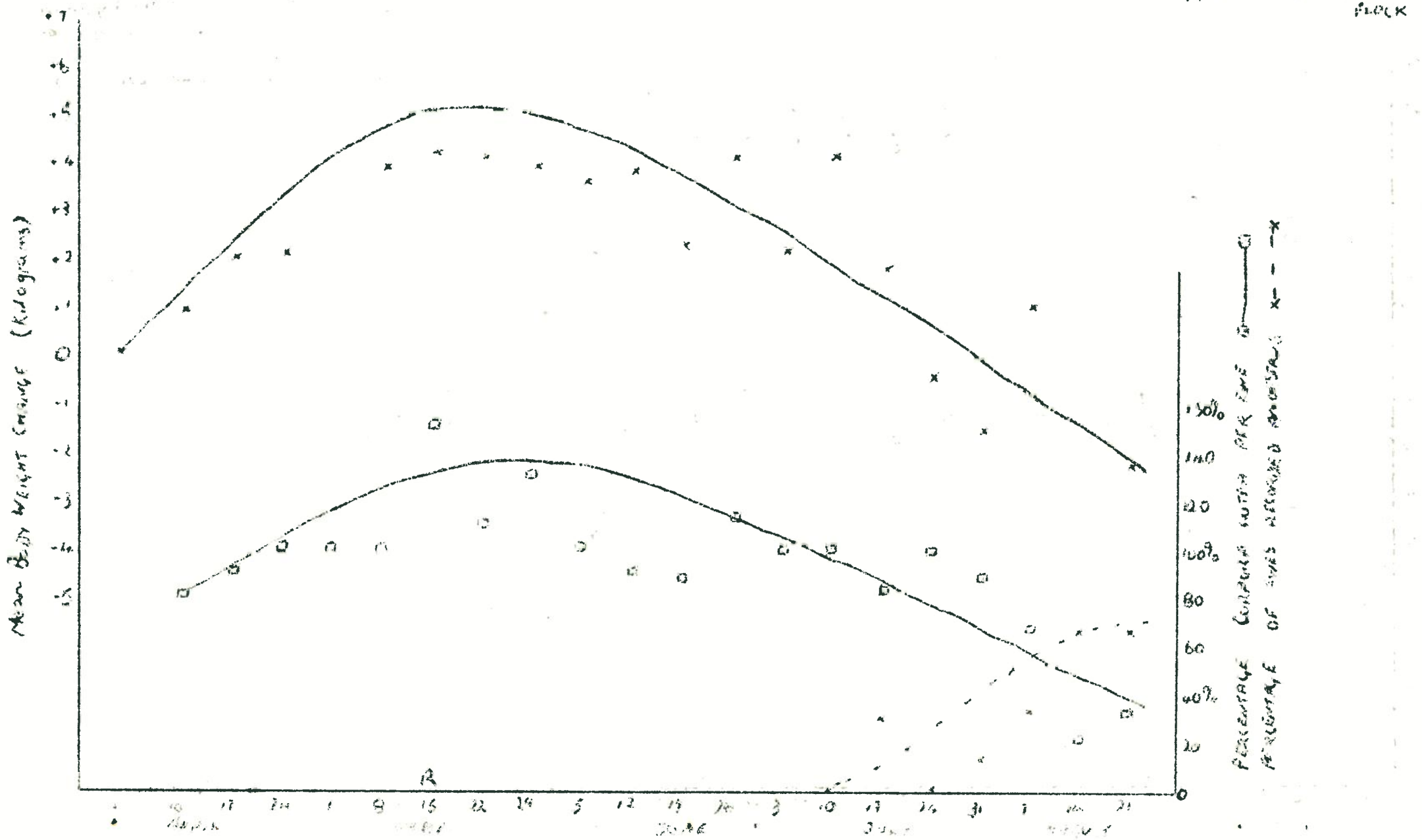
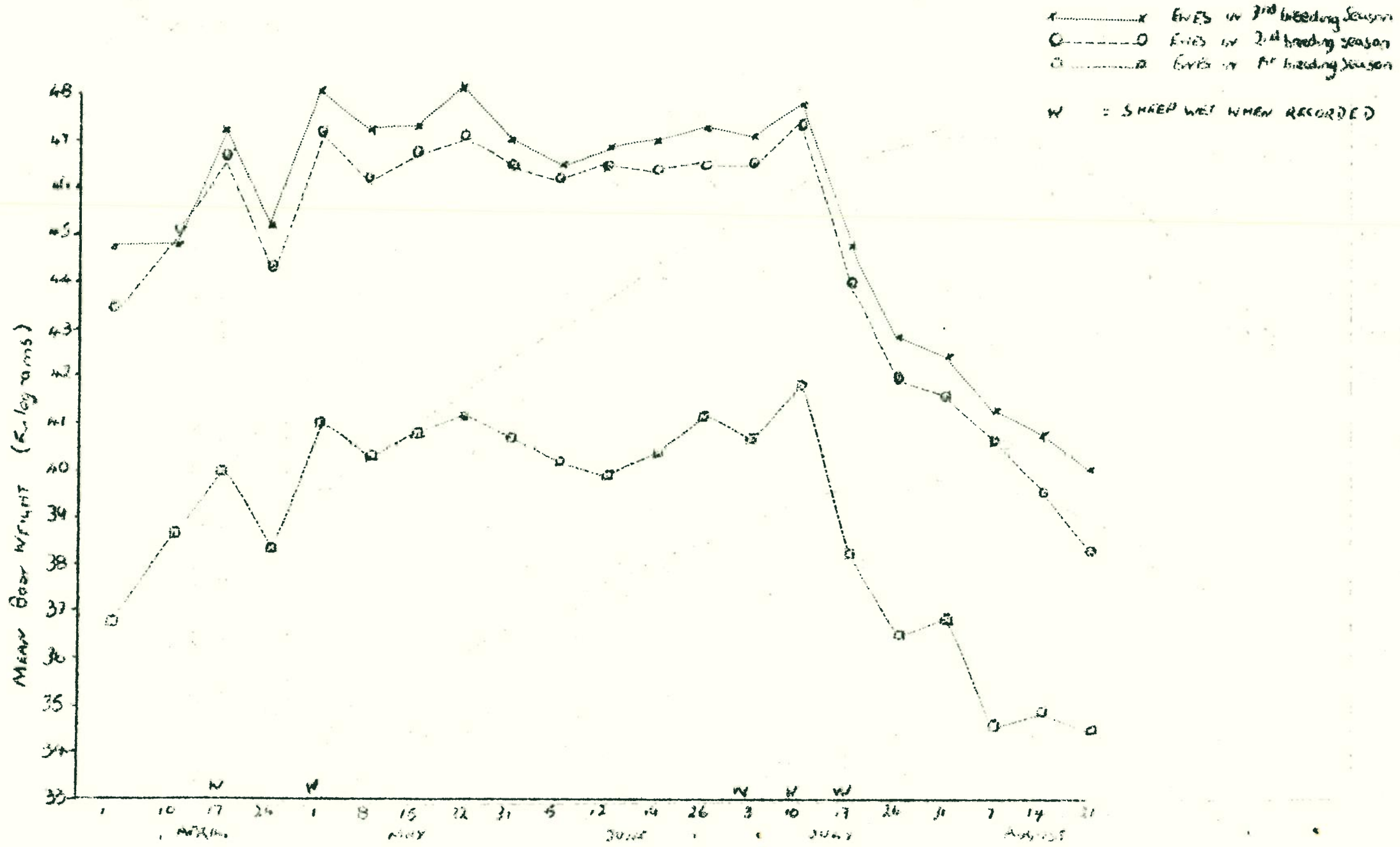


FIGURE 1 MEAN BODY WEIGHTS OF 16 EWES IN FLOCK OF 3 AGE GROUPS FROM APRIL TO AUGUST 1975 AT NORTH ARM



REPORT ON THE INFORMATION COLLECTED AT HILL COVE 1978/79 CONCERNING PERINATAL MORTALITY AND LAMB PERFORMANCE

Summary

In two flocks of ewes (Mount Edgeworth, 2- and 3-crop, and Main Point 1-crop) the apparent lambing percentages were 82% and 84% respectively but the apparent lamb losses were 12% and 25% respectively.

Although the birth weights of lambs in Crooked Inlet West (3.3kg) which were born in mid October were lighter than the lambs born in Holmsteds (3.8kg) in November, the difference had disappeared by weaning when the average body weight of 252 lambs was 19.1kg.

The method of recording is briefly described and the problems and inaccuracies discussed. Lines of further investigation are suggested.

Introduction

In September 1978 nine farms were asked to participate in a small pilot survey to obtain information on ewe barrenness, perinatal mortality of lambs, lamb birth, marking and weaning weights..

The information received from Hill Cove is presented below.

Ewe barrenness and perinatal mortality of lambs

In each of two flocks, Mount Edgeworth and Main Point, 100 ewes were examined approximately one month before the onset of lambing. Those ewes which were thought to be in lamb were raddle marked with one colour and those thought not to be in lamb were marked with another colour.

At lamb marking, these ewes were again examined and the state of the udder recorded as being "milk" or "dry". It was considered that "milk" ewes had produced a lamb which had effectively suckled for some time and those that were "dry" had either not produced (i.e. were barren) a lamb or had given birth to a lamb that had not suckled effectively and had died.

Unfortunately it was not possible to follow the progress of the ewes through to weaning but the details of the recorded information are set out below:-

Mount Edgeworth flock of ewes having their second and third lambs ($3\frac{3}{4}$ and $4\frac{3}{4}$ years old respectively).

Random sample of 100 ewes examined one month prior to lambing:-

64 in lamb and 36 not in lamb.
at marking:- of the 64 thought to be in lamb, 60 were "milk" and 4 "dry"
of the 36 thought not to be in lamb, 22 were "milk" and 14 "dry".

Therefore a total of 82 were "milk" compared to a recorded lamb marking percentage of 69.4% (on ewes present) indicating a loss of about 12% between birth and marking.

The apparent lambing percentage was 82%.

Main Point flock of 100 maiden ewes:-

of the 64 thought to be in lamb and the 36 thought not to be in lamb when examined one month prior to lambing, 60 and 24 respectively had milked and 4 and 12 respectively were dry.

The lamb marking tally was 58.8% which shows an approximate loss of 25% (60 + 24 = 84 - 59 = 25) between birth and marking.

The assumed lambing percentage being 84%.

Lamb Birth Weights

Crooked Inlet West The onset of lambing in this flock of mixed age ewes was in the middle of October and the lamb birth weights recorded in the first 24 hours of life between 13th and 23rd October 1978 were as follows:- (lamb's sex was not recorded)

ewe age	number	lamb weight (± 1SD)
5 crop	21	3.4 ± 0.7kg
4 crop	1	3.0kg
3 crop	12	3.1 ± 0.6kg
2 crop	2	4.3 ± 0.3kg
1 crop	1	3.8kg
0 crop	7	2.7 ± 1.4kg
Total	44	3.3 ± 0.8kg

The average weight of lamb per ewe from 41 ewes (i.e. three sets of twins) was 3.5 ± 1.0kg

Holmsteds The onset of lambing in this flock of mixed age ewes was at the very end of October and the lamb birth weights were recorded between 30th October and 12th November.

ewe age	number	lamb weight (± 1SD)
2 crop	4	4.0 ± 0.6kg
4 crop	19	3.8 ± 0.7kg
5 crop	1	4.0kg
Total	24	3.8 ± 0.6kg

If the period 30th October to 12th November is approximately equally divided, the birth weights of the lambs were as follows:-

14 lambs born between 30th October and 4th November = 3.8 ± 0.7kg
10 lambs born between 5th November and 12th November = 3.8 ± 0.5kg

The Average Weight of lamb per ewe (including two sets of twins) was 4.2 ± 1.1kg

The Average Weight of 11 male lambs was 3.9 ± 0.6kg
The Average Weight of 13 female lambs was 3.8 ± 0.7kg

Lamb weaning weights

In February 1979 a random cut of lambs from each of three flocks were taken and weighed immediately after gathering except in the case of the West Lagoons lambs which were weighed two days later.

Units (where applicable) expressed in kg ± 1SD

Flock		Ewe	Wether	Total
Holmsteds 13.2.79	Number	45	56	101
	Weight	19.2 ± 2.9	19.6 ± 2.9	19.4kg
West Lagoons 15.2.79	Number	42	37	79
	Weight	18.1 ± 3.3	18.2 ± 3.9	18.1kg
Crooked Inlet West 16.2.79	Number	38	34	72
	Weight	19.6 ± 3.4	20.3 ± 3.0	19.9kg
TOTAL	Number	125	127	252
	Weight	19.0kg	19.4kg	19.1kg

Discussion

All the information presented here has been gleaned by the farm staff and, because of some uncertainties about the recording procedures, none has been subjected to statistical analysis. However, the nature of the investigation was that of a pilot and no aspertions should be cast on the value of the information collected - information which has been entirely lacking until now.

The most salient features of the ewe barrenness and perinatal mortality were:-

1. The inaccuracy of examination of the ewes one month before the onset of lambing was biased towards the so-called "dry" ewes, at least 22 out of 36 and 12 out of 24 did, in fact have lambs which were suckled. Shepherds' observations have been that, in normal years, lambing is always slow to start and builds up to a peak in the second and third weeks after the onset. Therefore by examination at one month prior to the onset most of the ewes will be at least 6 - 7 weeks from lambing (i.e. 42 0 49 days) and many will be more than this, hence the difficulties of examination leading to the inaccuracies outline above.

2. 82% of the 2- and 3-crop ewes had lambs but 12% of those lambs died before marking whereas 25% of the lambs born to maiden ewes died in a similar period, their lambing percentage being 84%. From the lamb birth weights at Crooked Inlet West (Hill Cove) it is seen that these maiden ewes produced lighter lambs than older age groups. This is in accordance with the findings at Salvador where 1-, 2-crop ewes produced lambs of 3.8kg and 3-, 4-, 5-, 6-crop ewes averaged 4.2kg per lamb. The less good mothering instincts of maiden ewes combined with the lower birth weights of their lambs probably accounts for this very high loss of lambs born.

It should be noted that most of the figures are not precise but should be regarded as approximations.

The unknown factors involved in the accumulation of lamb birth weight information under the very extensive and difficult field conditions of the Falkland Islands should not depreciate the value of the information collected. Although the lambs were all weighed when less than 24 hours old, it is not known whether or not they had suckled and nothing is known of the ewes' physical state. However, it seems probable that there is a difference between the two flocks (3.3kg and 3.5kg) but whether this is due to a difference in lambing date or some other factor(s) is impossible to say. Any difference had disappeared by weaning (although the same lambs were not recorded).

The mean lamb birth weight for both flocks was 3.5kg (68 lambs) which compares with 4.0kg from 317 lambs at Salvador (in the FYRGS Trace Element Trial 1977/78 Study). The average weaning weight of wether lambs was slightly greater than that of ewe lambs in all three recorded flocks and the grand mean of 19.1kg (from 252)

compares with 19.9kg at North Arm (100 wether lambs) and, at Salvador, 17.9kg (100 ewe lambs, Ronda flock) and 22.5kg and 23.6kg (50 ewe and 50 wether lambs respectively, Limpet Creek flock).

As mentioned above, any difference in birth weights between the early (Crooked Inlet West) and later (Holmsteds) born lambs had disappeared by weaning - 19.9kg (from 72) compared to 19.4kg (from 101) respectively.

Conclusion

A more accurate method of pregnancy assessment is required, possibly using the Sonicaid ultrasonic fetometer but until that becomes possible it is necessary to repeat this year's recordings to obtain further information.

Such information is required on the different pregnancy rates according to age and the subsequent lamb losses.

It is hoped that the recording of lamb birth weights and weaning weights will be repeated and augmented by marking weights.

It is most gratifying to have the information presented so far and we are now beginning to find out a little about the Falkland Island Sheep.

Acknowledgements and thanks are due to Mr. L. G. Blake, Mr. T. Aldridge and all others who assisted in the collection of these data.

R. S. Whitley M.R.C.V.S.
19th March 1979

REPORT INTO AN INVESTIGATION INTO EWE BARRENNESS AND PERINATAL MORTALITY IN LAMBS BORN FROM MAIDEN EWES AT PORT STEPHENS 1977/78/79

Summary

In 1978, a group of maiden ewes were examined for evidence of success in rearing a lamb. It was found that 44% were unsuccessful. A year later at their second lambing 61% of the remaining ewes were unsuccessful and 21% were "barren" on both occasions.

In 1979 a curther sample of maiden ewes were examined approximately two weeks prior to the onset of lambing and a group of pregnant ewes identified. At weaning 15% were found to have lost thier lambs at, or very soon after, birth.

Comparison between the two years was difficult because of a change in management practice.

Further lines of investigation are suggested.

Introduction

At Port Stephens - a farm which has consistantly low lamb weaning percentages but which has subsequent low losses to shearing - the maiden ewes have, for some years, been shorn two weeks to one month before the onset of lambing. Apart from one year when there was an enforced delay in shearing which coincided with very poor weather conditions resulting in high losses of ewes and lambs, the exercise is probably a success in that more lambs are reared to weaning and the ewe loss is reduced.

The fact that these ewes have to be handled near to lambing has been utilised in such a way, as described below, to gain information about barrenness and perinatal mortality.

Methods

In the period 1977/79 as part of an investigation into the effects of cobalt supplementation to maiden ewes, a group of 200 ewes were randomly selected at prelamb shearing (Group 1). These maiden ewes were run with their normal flock and examined at weaning. Although for the purposes of the cobalt investigation, body weights were recorded, data presented here are limited to those recorded from examination of the ewes' udders and classification as those that had milked and those that had not.

In 1979 these same ewes (or the remainder of them) were again examined after their second pregnancy and a similar classification made.

Also in 1979, a further group of maiden ewes was identified by ear tagging at shearing in November. These ewes were specifically selected for evidence of their being in lamb (by abdominal palpation and udder enlargement). Again they were run with the rest of the flock and examined at weaning time (identical to lambmarking on this farm). Results of the udder examination are presented below.

Results

Group 1 (disregarding any effects of the cobalt treatment)

In 1977/78

200 examined prelambing (3.11.77)

173 examined at weaning (23.3.78) of which

96 (56%) had lambed and successfully milked (but not necessarily all the time to weaning) and

77 (44%) had either not lambed or had lost their lambs very soon after birth.

The flock lamb weaning percentage was 38.5%

It is apparent that the two years 1977/78 and 1978/79 produced very different results from the flock (38.5% and 58.1% lamb weaning percentages respectively), and although the latter year was very dry in the summer and the onset of grass growth in the spring having a few "false starts", the main difference is probably due to a change of pasture for the lactation period.

In previous years (such as 1977/78) the ewes lambed in Cow Valley camp and, at weaning, the lambs tended to be very variable in size and condition and many of the ewes were in poor condition. In 1978/79 Cape Orford camp was used for the lactational period and the (assumed) better nutrition there is shown by the comparison of the percentage of ewes which are known to have lambed but are now drying off:-

1977/78	32%
1978/79	4%

(Although this comparison is not strictly valied, because the 1978/79 ewes were specially selected, it does give an indication of the difference.)

Because of the change in management practice further direct comparison between the years would be misleading, nevertheless it is apparent that in both years there must be a significant proportion of the ewes which totally failed to lamb at all. In 1977/78 44% were, to all intents and purposes, barren. In 1978/79, if 82% of the ewes examined had been suckled by a lamb and most (96%) were still being suckled by a lamb, but the flock lambing percentage was only 58.1% then there must be quite a sizeable proportion of the flock which is totally barren.

The recording of Group 1 over a period of two years showed that 23 out of 111 (21%) ewes were barren on both occasions.

The fact that 33% lambed as maiden ewes but not in their second crop and 16% were the reverse of this, is contrary to what was expected and requires further investigation. Apart from the maiden ewes, all ewes are run in flocks of mixed ages and so further information cannot be gleaned from flock figures.

Conclusion

It is apparent that a significant proportion of the ewes do not produce a lamb which suckles effectively. It indicates that further investigation is required to determine the percentage of ewes in lamb at the onset of lambing and so points out more closely the point at which this loss of production occurs. The fact that the ewes are brought in for shearing presents a good opportunity for detailed examination using the Sonicaid fetometer. It is hoped to do this next season.

Setting aside the reversal of the expected figures for these ewes in Group 1 which were examined twice but lambed only once, (a fact which requires more detailed study) the figures of 21% of ewes which were "barren" on both occasions indicates that further investigation is required and, if it is a true figure, the possible instigation of a ruthless culling programme.

Acknowledgements

The collection of much of these details was done by farm staff whose general enthusiasm and interest made the project easier. It is hoped that the mutual stimulation thus derived will lead to a greater understanding of the flock problems of Falkland Islands sheep.

R. S. Whitley
27th March 1979

Investigation into barrenness and perinatal mortality at Pebble Island 1978-79

Introduction: One of the most serious gaps in the knowledge of breeding success of Falkland Island sheep is that it is not known what proportion of ewes do produce lambs even though many of these lambs may be lost before marking. The significance of this information is not restricted to the ewe's reproductive success but also to that of the rams in covering the ewes in a very extensive environment.

Present day trends are towards total isolation of the ewes at lambing time - hence selecting very heavily towards an "easy-care" sheep - whereas, in the past when the ewes were shepherded, some indication of percentage of ewes lambing was available from the shepherds, but this was still only an indication.

This investigation on Pebble Island was organised to obtain information on perinatal mortality without involvement in lamb birth recording, on barrenness, and on ram/ewe reproductive success. All recording, selection of animals and field work was performed by farm staff.

Materials & Methods: A random sample of 200 ewes of mixed ages was separated from the rest of the "Big Flock" (2434 ewes) on 3rd October - lambing being due to commence on 16th October. Examination of the abdomen and udders of these sheep lead to the conclusion that 175 were in lamb and 25 were thought not to be in lamb. Ewes in each of these two groups were given different coloured ear tags for later identification at lamb marking and weaning times (Dec 12th and Feb 2nd respectively).

Examination at these times resulted in the ewes being classified as either "reared lamb", "part reared lamb" (i.e. she gave birth to a lamb which suckled but had since died. This was judged by the condition and contents of the udders), or "barren" (even though she may have given birth to a lamb which never suckled).

The results are laid out below:-

	Prior to Lambing	Marking	Weaning
200 ewes	175 in lamb	140 reared lambs 18 part reared lambs 8 barren	131 reared lambs 18 part reared 6 barren
	25 not in lamb	14 reared lambs 3 part reared lambs 14 barren	14 reared lambs 1 part reared 8 barren
Totals:	200	197	178
Ewe loss (%)	1.5%	9.6%	

Lambs marked:

ewes	89
wethers	72
rigs	1
	162 = 81% of ewes at lambing

Discussion: This island farm normally has a higher lamb marking figure than many mainland farms, and in this group of 200 ewes, the 81% is reflective of the flock percentage.

In an attempt to decrease the (presumed) early embryonic mortality caused by stress at the time of ram lifting, the manager for the first time, left his rams with the ewes for longer than the traditional 6 weeks. This would tend to lead to a prolonged lambing and greater difficulty in examination of some ewes prior to the onset of lambing.

Of the 197 ewes remaining at lamb marking time, 175 had lambed but 17 of these were originally thought to be barren. This indicates the inherant inaccuracy in this method of separation of pregnant from non-pregnant ewes even when the examination is performed by experienced stockmen.

Coverage of the ewes by rams is indicated by the 175 ewes out of 197 (89%) which are thought to have produced a lamb (by udder examination). This does not allow for those ewes which, although pregnant, did not successfully produce any milk, but even so, the figure is lower than expected.

It is interesting to note that the greatest losses between marking and weaning occurred in the ewes thought to be barren (36%) compared to 6% in the ewes which reared lambs.

A further inaccuracy in this method is shown by the fact that the lamb marking percentage of 81% was 8% less than the calculated birth percentage of 89%. This is to be compared with 12% of the ewes which had produced a lamb failing to rear it to marking time. The discrepancy presumably is because some of the lambs survived even though they ceased suckling their mothers.

Conclusion: Although it provides information about the reproductive success of ewes in a cheap and relatively simple way which could easily be performed by farm staff, the method is not accurate enough for reliable conclusions to be drawn concerning perinatal mortality and ewe barrenness in a flock situation.

Acknowledgements: I am indebted Mr. G. O. Evans and his staff who performed all the selection, recording and field work.

R. S. Whitley M.R.C.V.S.
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SOME NOTES ON FACTORS CONCERNED IN THE FORMULATION OF A BREEDING PLAN FOR SHEEP FLOCKS

R. S. WHITLEY M.R.C.V.S.

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Introduction

Since the earliest times man has castrated animals which thus enabled him to keep fewer entire males in his flocks and herds and so increase the degree of selection for characters he was trying to improve.

Although the Romans and Greeks were very interested in animal improvements, the subject went into a decline during the Dark Ages and it wasn't until the 18th Century that refinements were made to methods used in sheep breeding. These laid the foundation for modern practice and were developed in Britain by Robert Bakewell who developed the Dishley breed which later became known as the English Leicester.

Intense interest was thus aroused and breeders became involved in many different methods for trying to improve sheep strains basically aimed at the meat market and secondarily at the wool market - the latter being stimulated by imports of breeds from Europe during the Peninsular War.

Various theories concerning the breeding of sheep were developed in subsequent years including "The Doctrine of Constancy of the Breed" ("the certainty or uncertainty in the inheritance of characters by an animal depends on whether their decent is pure or not"), which attached great importance to the knowledge of Pedigree; and the theory that indigenous breeds were more satisfactory because they were adapted to local conditions (while this may be true for characters affecting the survival fitness of animals, it ignores the possibility that improved breeds may be more productive when natural constraints are removed).

The monk Gregor Mendel postulated that in biological systems some characters were controlled by directly related factors which occurred in pairs, one of each pair from one parent being matched by one of a similar pair in another parent but that some factors, although they may be carried by an animal or plant, are not actually revealed (i.e. one factor is "dominant" to another). However, in animal production, Mendelian genetics is limited to the few characters which were found segregating in different breeds (i.e. coat colour, horned or polled characters). In most instances of characters concerned with animal production, the many factors are often interrelated and so there are intermediate levels instead of such sharply defined characteristics as black and white wool. And so it was shown that one cannot expect rapid improvement in (say) fleece weight by introducing a single major gene (factor) because of its complex interrelation with other factors.

The aim of animal breeders has always been to produce superior animals by manipulating the inherent qualities of the stock. Most breeding animals have been chosen on their own appearance while there was no precise information about the relative merits of pedigrees, progeny or other relatives. The Breed Societies have been concerned with protection of the purity of the breed with emphasis varying between type, show points and productivity (with concurrent development of uniformity).

Thus modern genetics (and hence breeding programmes) are based on two principles: firstly, that the appearance is not always a reliable guide to its value as a breeding animal (this depends on the inherited characters and the effect of environment on development); and secondly, that modern applied genetics has placed emphasis on breeding only for those characters that are important for commercial production. When looks (type) are rated then it is necessary to discard some animals which are good producers.

These factors have led to arguments between applied geneticists and stud owners to whom type ratings and show success have (considerable) monetary value.

Manufacturing processes demand a certain combination of characters in wool and the nearer that a producer is able to approach that ideal, the higher the price is paid for his wool. However, with the wide range of manufacturing demands that

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exists, it is necessary for the producer to define his aims in terms of wool type considering the environmental effects on the wool production and the market on which his wool is sold. When there are few puchasers the producers must be aware of the commercial factors which control the price paid for wool.

The weight of a wool sample, its crimp number per inch, the length and colour are the most important economic traits for raw wool at the moment, but processing demands are leading to increased attention to fibre diameter and this, therefore, should replace usually assessed crimp number as the selection criterion, as well as the factor on which prices are based. Visual classing of sheep produces a greater increase in value as selection or management. The cost of fleece weighing would need to be balanced against the gain but little gain can be expected when selection is limited to visual assessment of unmeasured parameters.

In defining production aims, it is necessary to know by how much the selected characters are affected by breeding or by environment and for which of these factors the buyers are prepared to pay (e.g. the "economic weight" for the amount of clean wool weight may be four times that for crimp number).

It is essential to distinguish inheritance from the effects of environment as the latter are not passed on to the offspring and do not contribute to the individual's breeding value. It is pointless to say that Merinos produce heavier fleeces than Bikaneri if the comparison is between the Merinos of New South Wales producing 7kg of wool and the Bikaneri cutting 1½kg in the deserts of Rajasthan.

Heritability estimates the proportion of the parents superiority which will, on average, be demonstrated in her offspring and can be measured by how closely relatives resemble each other when compared with unrelated individuals in the same population. If the heritability is low then the rate of progress by selection will be slow. Individual selection for some fleece quality characters is likely to give rise to a fairly rapid response in genetic improvement, but it should be remembered that a highly heritable character may not necessarily be a commercially desirable one.

Traits, which are moderately highly heritable in Merinos and other allied breeds (taken at 12 months or older), include:- greasy wool weight, percentage clean yield, clean wool yield, body weight, wrinkle score, face cover score, fibre number per unit area, fibre diameter, staple length and number of crimps per inch.

Many characteristics in animals are not independent; for example in Merino flocks, sheep with high wool weight often have a long staple, while animals with a high degree of skin wrinkle tend to produce a short staple. Response to selection for high wool weight in sheep is usually accompanied by a decrease in the number of crimps per unit of staple length. In other words, there may be a positive or negative "correlation" between characteristics, the observed size of which may not be as great as, or it may be greater than, that which is expected because of the interrelation of genetic make up and the environment.

Thus it is apparent that knowledge of the direction and degree of correlation is important in formulation of efficient breeding plans.

The table below listing the extent and direction of correlation between some of the production characteristics is included to show how all these factors are interrelated. (-ve means negative, +ve means positive, Ph = phenotypic correlation and G = genotypic correlation) -

Clean wool weight	has a positive phenotypic (+vePH) and positive genotypic (+veG) correlation with yield, staple length, fibre number per square millimeter, fibre diameter (although the level varies from flock to flock).
" " "	-vePh, -veG with crimps per inch
" " "	+vePh (variable) with body weight and wrinkle score

Wrinkle Score	+vePh, +veG with greasy wool weight
" "	+vePh, but negligible G with clean wool weight
" "	-vePh, -veG with staple length
" "	+vePh, +ve G with crimps per inch
Fibre No. per mm^2	-vePh (low), -veG (low) with staple length
Fibre diameter	-vePh (low), -veG (low) with crimp number
Crimp number	-vePh, -veG with greasy and clean wool weight yield and staple number

There are variable (but usually positive) estimates for correlations between numbers of lambs born and weaned and some wool and body characteristics such as body weight.

It is therefore apparent that in selection there must be compromise. For example, the disadvantages of a decrease in the number of crimps per inch must be considered against the more rapid increases in fleece weight. Hence the problem becomes one of relative economic merits of the two courses of action, unless a lower rate of progress is accepted and selection is for the two characters at the same time. (Although there may be a slight concomitant decrease in fibre diameter, the most promising way to increase fleece weight without a change in quality is to increase fibre density.)

The economic weight (commercial merit) is usually the relative market value of the trait under consideration or the relative preference of the breeder derived from some other consideration.

Having decided on which characteristics selection is to be based, the extent to which such selection will raise production in the existing flock depends on the repeatability of the production characteristics and their heritability and genetic correlations.

Repeatability, the degree to which a characteristic is likely to recur, measures the extent to which differences between individuals depends on genetic and permanent environmental effects, rather than those which are temporary. In other words, by taking repeated measurements on one individual, one can reduce variations resulting from temporary environmental effects and so assess the repeatability of a characteristic. For example, whilst the repeatability of one lambing record is low - temporary environmental effects (weather, men dogs etc.) may affect such records - selection accuracy can be increased by taking into account several lambing records. Incidentally, the heritability estimate which is based on one lambing figure is low. The selection for any characteristic should be based on as much information as possible and as is practical.

The total weight of greasy wool on a sheep is composed of various factions:- wax, suint, dirt, vegetable matter and clean wool weight, the latter being proportional to components which may be represented by the formula LANDS where

L = Average length of fibres
A = Average cross-sectional area of fibres
N = Total number of fibres
D = Density (Specific Gravity) of wool
S = Area of skin growing wool

(N ÷ S equals the wool fibre density in the skin)

All the component factors of clean wool weight are highly heritable therefore there is little point in limiting selection to one specific factor at the deliberate expense of others.

Wool quantity, as well as quality, changes with age, therefore there are, for ewes, three broad groupings within each of which fleeces will be fairly alike for fibre diameter, length and crimp number:-

$2\frac{1}{2}$ - $4\frac{1}{2}$ years, $5\frac{1}{2}$ - $8\frac{1}{2}$ years and $9\frac{1}{2}$ - $10\frac{1}{2}$ years.

Some of the components of clean wool weight are little affected by environmental influences on the adult sheep. For example, the wool follicles are laid down in

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early life therefore different nutrition does not lead to a change in their numbers. Consequently a change in wool weight due to nutrition is a result of change in fibre volume (i.e. length x cross-sectional area). Whilst maintaining constant crimp number and staple length, selection for increased clean wool weight leads to an increased number of fibres per unit skin area.

A high level of Reproduction rate is required:-

(1) to ensure replacement in a breeding flock of fixed size;

(2) to provide surplus stock, either for sale or to build up numbers (after losses or to take advantage of pasture improvement); and

(3) to ensure as high a selection differential as possible - in a flock of fixed size, a higher reproduction rate means that replacements form a smaller proportion of the total animals available for selection.

For replacement, ewe offspring are the main concern but for suplus stock both sexes are valuable.

When considering sheep reproduction in an extensive environment, it is vital to take into account the concept of the ewe's capacity to rear a lamb with high weaning weight (Mothering Ability) which has several components including the lambs' birth weight and vigour, the lamb's capacity for growth. the ewe's milk production and her mothering instinct. However, it is totally unnecessary to quantify any of these components as the mothering ability and her ability to produce lambs can be measured by weighing and "scoring" her lambs at a certain time after birth (i.e. at weaning).

One problem can arise when culling young animals on visual appraisal alone because there is an unconscious selection against twins, which are generally smaller in early life, in the absence of information about the litter size in which the lambs were born.

Shearing at "12 months" of age includes a range in age of about 40 days which can result in a difference of over three-quarters of a pound of greasy wool weight between the youngest and oldest animals (Australian Merinos), as well as an appreciable body weight difference. Therefore selection at as late an age as possible is more satisfactory (i.e. at 15 - 16 months) when more of the variation is due to the interaction of environment and genetic make up rather than due to age.

As stated before, the repeatability of one lambing record is low. Nevertheless lambing records are the key to the success of a particular sheep in the environment in which she is kept. Taken over a period of years (say 3), the repeatability of the total weight of lambs produced and reared to weaning is high and, after all, what is required is not a theoretically successful sheep which looks pretty. but one which has proved herself capable of producing good lambs in that particular environment.

If selection is based on a lamb production index derived from the weight of lambs weaned by the ewes after correction for the number of lambings, it is apparent that selection is considerably biased towards ewes which have twins. Twinning rate responds to selection and is a more efficient method of improving the number of lambs weaned per ewe joined than is a selection against barrenness.

It has been found that there is a positive correlation between body weight, clean wool weight and reproduction rate, although the figure is much higher for the Welsh Mountain sheep than for the Australian Merinos and Scottish Blackface.

Two other body characters have been found to strongly affect the reproduction rate (1) total lamb production (in one trial) was about 20% higher in open faced Corriedale ewes and differences of a similar order were found with Romney ewes. Fleece weights however tended to be higher in sheep with woolly faces, although the differences were small. But as open faced sheep produced more lambs, there is obviously an increase in total wool production from this

source. In the Rambouillet breed, it has been found that ewes with open faces produce 11% more lambs and more lbs. of lambs than woolly faced ewes and this was in spite of 3 periodic clippings to prevent wool blindness. So, in this breed at least, the poor lambings cannot only be due to the fact that wool blind ewes have difficulty in seeing their lambs and food.

Secondly, wrinkled sheep had about twice the annual death rate of plain bodied sheep (in one Australian trial). The ewes also produced and reared fewer lambs to weaning and had a poorer constitution.

Sheep can be regarded as machines for turning pastures, or other food, into saleable products. Their efficiency in performing this task is therefore an important characteristic.

A sheep's ability to utilise pasture may depend on 4 factors:-

(1) its ability to walk and seek food;

(2) its ability to seek food of better quality from the acreage available;

(3) its appetite (total food consumption); and

(4) its ability to turn the food it consumes into wool, meat or lambs (efficiency of conversion).

However, if a sheep produces more because it eats more then it may be that the increase in cost of porduction is greater than the increase in final return. But it has been found that efficiency is always greater than the increase in final return. But it has been found that efficiency is always greater in the higher producing animals regardless of body weight but the efficiency fraction of the wool weight difference increases as the difference in body weight decreases. Thus selection of a breed or strain on wool weight per head would also mean selection of a more efficient one. The wool to food ratio is highest for the Lincoln, then the Polwarth, Corriedale, and lastly the Merino.
(Corriedales produce more wool than Polwarths but eat so much more). These considerations are important in view of the changing feed levels which occur under pastoral conditions.

Incidentally, selection based on the weight of wool produced per pound body weight will tend to lower body weight and hence efficiency. What is required for alternating plenty and poverty conditions is not necessarily the sheep which can extract a maximum output for a minimum of input, but rather one that has the capacity to use the greater amount of food when it is available in times of poverty. A larger appetite, provided that it is combined with above average efficiency of conversion, is an asset.

Thus it can be seen that, although body weight itself has relatively little economic weight, its inclusion as an index always leads to appreciably greater economic gain. This is probably because of the higher efficiency and the high heritability of body weight and its positive correlations with important traits such as wool weight and fertility. (There is some difference of opinion concerning this statement but the general concensus supports it.)

Because the proportion saved is much lower for rams than ewes, the selection differential is correspondingly higher, so that ram selection will, per capita, contribute more to genetic gains than ewe selection. However, the success of ram selection depends entirely on the genetic potential carried by the ram which he inherited from his parents. In other words we have a "chicken and egg" situation which can only be resolved by defining the limits of our assessment methods and the time taken for such assessment to occur. It is therefore a mistake to assume that ewe selection is of no importance at all; the contribution of ewe selection to genetic gain depends on the level of culling which is possible, and this in turn is related to the flock structure and reproduction rate (i.e. what proportion of the lambs are required for replacement and this depends totally on the success of ewes in producing and rearing lambs in their local environment and under that particular system of management).

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Genetic progress depends on the intensity of selection applied to the parents and the extent to which the gains made by selection are passed on to the offspring (which depends on the heritability of the factor).

The prime concern of the sheep farmer, having an appreciation of the problems of heritability, correlation and efficiency, and particularly the farmer operating in an extensive environment, is to make use, by selection, of the wide range of genetic potential already available and functioning in his special environment and not by attempting to impose new genetic material which is unproven in that set of conditions.

There is a variety of selection methods and their suitability depends on the farming practice and the interrelationship of the factors being selected. Theoretical methods are of little concern where practical realities of the farming operation are involved.

One system (which is often practised by farmers, in any case) is the system of Independent Culling levels:- at any one time an animal is culled when its measurement of a trait is below a certain standard regardless of its merits in others. In other words, the individuals of a flock are first culled for character A until a certain level is reached, the remainder are then culled for point B to a certain level and the remainder for point C etc. This system is easy to apply and can be used in conjunction with quantitive information about fleece characteristics. The choice of characters represented by A, B and C etc. depend on the farmer's preference (economic merit) for the various points.

A second selection method which is sometimes used is that of Tandem Selection where selection is based on one character (such as wool weight) for a certain time and then is followed by corrective selection (e.g. for crimp number) for another period of time. This method, although it may lead to more rapid rates of genetic progress, is fraught with difficulties and is limited in the number of characters for which it can apply.

It is obviously an advantage to make the selection as early as possible in the animal's life so that the increased production in the current flock then operates for as long as possible, while future (improved) generations replace the existing one more rapidly when animals are mated at an earlier age, for example, with rams it is possible to get more rapid rates of genetic progress if the generation interval is short (i.e. may be as little as 2 seasons but this depends on the reproduction rate of the ewes and the selection differentials applied). But some traits cannot be accurately measured until a certain age. For example, the effect of age on clean wool weight is still measurable at an average time of 12 months from birth but the effect is less at 15 months - so compromise (again) is required. However, there is a fairly good relationship between hogg fleece weight and future production of the mature sheep (this relationship is higher in Merinos and Merino crosses than in Romneys). There is a tendency for the repeatability to be lower with mature fleece weights, possibly as a result of an increase in temporary fluctuations in environmental effects.

Practical Selection Methods are of as great variety as the sheep themselves but it is suggested that the most efficient method in terms of annual genetic economic gain is to select rams on the basis of the reproductive rate of their dams and the ram's own clean wool weight at the age of 15 months (i.e. selecting on clean wool weight of twin born rams), and to select ewes on their dam's reproductive rate and clean wool weight at 15 or 26 months (i.e. saving all twin born ewes and making up the total with singles selected on clean wool weight). Ewe selection at 26 months still further decreases the age effect on wool and body weights and selection as shearlings is generally thought to be "easier" than at the hogg stage.

It is apparent therefore that, in order to assess a ewe's reproductive rate (either for ram or ewe selection) observations must be made in the field and controlled measurements taken when possible in order to be able to realistically compare potential breeding stock. The advantage of immense proportions - is that the farmer then selects sheep which are productive in his set of environmental conditions.

The independent cull process for selection on wool characters may be listed as follows:-

1. Cull on eye appraisal for those sheep showing obvious fleece faults or defects in anatomy (i.e. undershot jaw or entropion - turned in eyelid);
2. Weigh the greasy fleece weights of the remainder and rank the sheep according to merit;
3. Cull those with low fleece weights and obtain yield measurements from the remainder by scoring test samples. Select a further proportion on their clean fleece weights;
4. From those that are left, obtain detailed measurements of the fleece characters - staple length, fibre diameter, number of crimps per unit length. Then make final selection of sheep on the basis of their fleece quality.

Needless to say. not all farmers are able to select on all these measurements, but selection based on progress down the list results in more money in the pocket.

Progeny Testing, if properly carried out, gives an unbiased estimate of an animal's breeding value. But selection of individuals on the results of a progeny test does not always give the most rapid rate of genetic progress. The long generation interval between primary selection of an animal and its final use decided on the basis of its progeny's performance, means a slow rate of progress. The practical difficulties of devising accurate and meaningful progeny testing programmes are almost prohibitive especially where the character under examination is only revealed in one sex (e.g. milk production).

A system in which true random mating occurs is one in which any individual of one sex and, in sheep, this implies that all males mate with an equal number of females. If the heritability of a trait is high, random mating following mass selection will lead to substantial genetic gain.

Therefore the larger the population, the more likely is random mating to avoid inbreeding which can then only occur by chance.

It has been said that the mating of related individuals is called linebreeding if it is successful and inbreeding if it is not! Never theless, inbreeding (or linebreeding) can be a useful method for increasing the genetic uniformity of a population but in general it leads to loss of thrift (inbreeding depression) a decrease of ovulation rate, disease resistance, fertility, fecundity and viability.

The crossing of two inbred lines results in heterosis (hybrid vigour) in which the offspring perform better than either of the parents for a particular characteristic. However, this phenomenon cannot be interpreted as demonstrating any superiority of inbreeding over other breeding systems such as selection and random mating. (In fact heterosis may only be a recovery from inbreeding depression.)

Artificial Insemination in sheep allows the widespread use of outstanding rams (but firstly they must be proved outstanding and not just adjudged so to be on the basis of their looks) and its use for rapid grading up is desirable especially where there is a large difference between existing and projected production levels. It is widely used in the USSR and China and, to a much lesser extent, in South America

With flocks of 3,000 ewes or more, AI shows an increase over natural mating in net annual genetic progress even though the rate declines with time through inbreeding, but with flocks of 1,000 or less the fall in net genetic progress under AI can be dramatic.

Artificial insemination programmes require relatively much greater capital outlay and recurrent expenditure than schemes based on selection (with recording) and random mating.

Traditional attitudes toward flock structure, with the pedigree flocks at the top of the tree followed by the stud and then the general (camp) flocks at the roots, imply that the flocks higher in the hierarchy have high levels of genetic merit than those lower down. If this is true, then there should be a fairly rapid rate of increase as rams with superior breeding value are used in the lower levels of the tree. But often the hierarchy does not reflect different levels of inherent merit in the stock and therefore there is little difference in genetic merit from top to bottom.

The age old attitude has been to try to improve from the top of the flock structure by using imported rams with supposed greater genetic potential. However, because pedigree and stud flocks are generally kept on better pastures and because of the relationship between actual appearance (phenotype), genetic make up (genotype) and environment it is incorrect to assume that these sheep would do as well in a different environment (refer to the comparison between the Merino in New South Wales and the Bikaneri in Rajasthan). This attitude can be compared with the application of fertilizer to the leaves of a tree instead of to the roots - not much will reach the broad base of the roots from which the tree itself grows.

In a flock which is breeding its own ewe and wether replacements, the optimal balance of breeding and non-breeding sheep on the same area of land, will depend on:-

1. The level and pattern of reproductive rate which will determine the size of the breeding flock needed to produce the required number of wool growing sheep;
2. The difference in wool production between breeding and "dry" sheep;
3. The relative prices of wool and surplus sheep.

Analysis of these various factors will reveal the casting age which will give the greatest economic return. (For flocks breeding their own ewe and ram replacements this analysis may show that rams should be used only 2 or 3 times and ewes 5 times.)

Flock size is a factor which limits the rate of genetic progress - the larger the number of animals, the greater the chance of breeding on outstanding sheep (the better the root system of a tree, the better nourished and developed will be the timber); in a large flock it is easier to increase the intensity of selection; as the flock size increases, there is more potential for using more refined techniques of selection; any deleterious effects due to inbreeding can be avoided much more easily in a large flock.

Therefore large farms with extensively grazing flocks of sheep are in a well-placed position to operate breeding programmes based on selection of sheep most suited to their own environment.

There is little need to import "foreign" unproven animals except when a rapid major change is required in production traits or when, as will happen later rather than sooner (especially in a large flock), response to selection for measured production ceases due to exhaustion to vailable additive genetic variance (or possibly due to antagonism between natural and artificial selection.

The first step in formulating a breeding plan is to define its aims and to seek an increase in productivity by concentrating on measured production itself instead of trying to assess it through possibly related characteristics, or wasting effort on unproductive aesthetic features.

NOTE ON NUCLEUS BREEDING SCHEME FOR THE FALKLAND ISLANDS C.D.K. 6/8/79

Summary

Examination of Records from 1.1 Salvador 73 age ewes and 73 age ewes from 3.2 Fox Bay East indicate that it is probable in the commercial situation to select ewes for the Nucleus Flock that have weaned a lamb successfully in three (3) successive years. Several opportunities (3) are available for selection for wool quality and and wool weight and any other desirable trait. The selections indicated below result in 8.3 per cent of the original maiden ewes mated joining the Nucleus Flock. A suggested selection procedure diagram is at Appendix 3.6.

1. The availability of performance records over three years of 73 age ewes from 1.1 Salvador and 3.2 Fox Bay East has permitted an estimate to be made concerning the possibility of the Flockmaster being able to select ewes, in sufficient numbers, that have successfully weaned lambs in three successive years (Eadie 78).

1.1 Salvador

year	73 age ewes mated	weaned a lamb	age group weaning percentage
76/77	48	27	56.2
77/78	42	20	80.1
78/79	37	15	67.6

That is to say $\frac{15 \times 100}{48}$ = 31% of those mated in year one can be expected to wean a lamb in three successive years.

2. The weaned weight of lamb at 1.1 Salvador when totalled over three years varied between 62.5kg and 92kg. A number of corrections could be made concerning birth dates, sex of lamb etc., but in no case was the individual lamb weaning weight "unacceptable" and no other ewes could compare in terms of total weaned lamb weight with ewes producing weaned lambs in three successive years.

3. Of these fifteen (15) ewes at 1.1 Salvador nine (9) were found to have produced 4kg greasy wool per year, and their totals varied from 13.40kg to 17.48kg over the three years.

4. From these records it seems possible for the Flock Master to select:-

a) Approximately one half of those youngest age ewes successfully weaning a lamb in year one for:-

i) having weaned a lamb
ii) wool quality
iii) wool weight

b) This population is reduced by 26% (25% Fox Bay East) in year two when those not successfully weaning a lamb are excluded;

c) A further reduction of 25% (30% Fox Bay East) can be expected to occur in year three when those not successfully weaning a lamb are excluded.

The Flockmaster should after the third season have for consideration approximately twice as many candidates for the Nucleus Flock as required. If the population at this stage is then halved, i.e. reduced by 50% the number finally selected is:-

8.3 per cent of those maiden ewes mated in year one

Provisos:
i) 3 ages only of ewes are run in the Nucleus Flock (3, 4 and 5 crop)
ii) The weaning percentage of the Nucleus Flock is 75%
iii) Four-fifths (80%) of the ram lambs weaned are retained.
iv) Ram lambs are used as sires for the Nucleus Flock.
v) Only 3 ages of rams are used in the Ram Flock (1-2-3 shear only).
vi) The loss rate in the Nucleus Flock is assumed 10% and in the Ram Flock 25% per annum.

NUCLEUS BREEDING SCHEME: SUGGESTED SELECTION PROCEDURE

(USING DATA OBTAINED FROM 1.1 and 3.2 1976-79)

→ TO NUCLEUS FLOCK 200 {8.3% OF MAIDEN EWES ORIGINALLY MATED}

SELECT $\frac{1}{2}$

200 — 200 ONLY REQUIRED ← SELECTED FOR

1 HAVING WEANED 3 LAMBS
2 WOOL QUALITY
3 WOOL WEIGHT

400 — WEAN A LAMB THREE SUCCESSIVE YEARS

533 — WEAN A LAMB TWO SUCCESSIVE YEARS

720 selected ← SELECTED FOR

SELECT $\frac{1}{2}$ *

1 HAVING WEANED A LAMB
2 WOOL QUALITY
3 WOOL WEIGHT

1344 wean a lamb

2420 maiden ewes

2200 one-crop

2000 two-crop

1800 three-crop

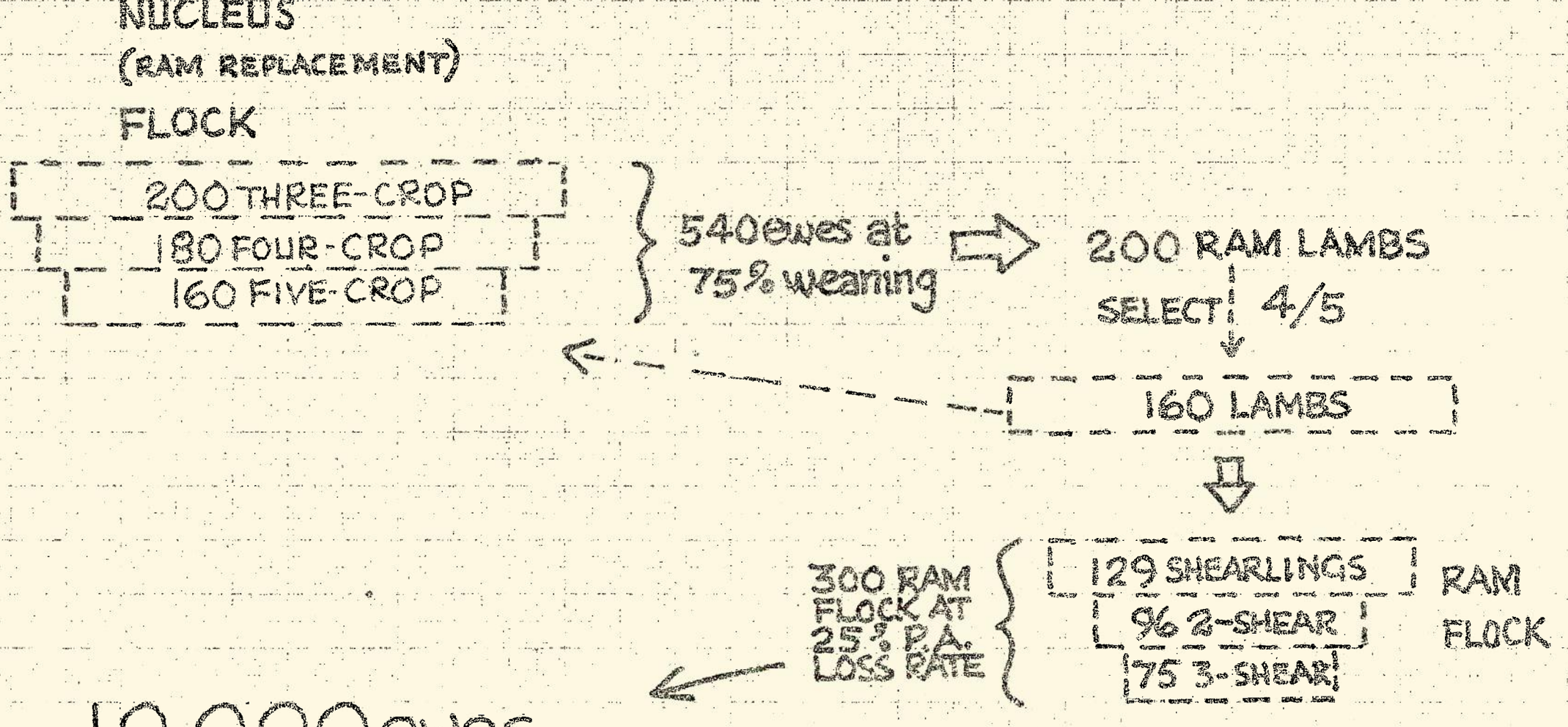
1620 four-crop

(1400 five-crop)

} 10000 BREEDING EWES IN 5 AGES AT 10% LOSS RATE PER ANNUM

* Those lactating are drafted and examined for wool quality, etc. Those selected (1100?) are tagged and fleeces weighed. Lower fleece wt. ewes have tags removed this or following year. Subsequent selections made by tag removal.

NUCLEUS BREEDING SCHEME : THE NUCLEUS AND RAM FLOCKS



REPORT INTO THE PROGRAMME OF ARTIFICIAL INSEMINATION OF COWS IN THE FALKLAND ISLANDS BETWEEN JANUARY AND APRIL 1978.

SUMMARY: A brief history is given of the factors which led to the inception of the A.I. programme. The logistical and managemental problems are outlined and reasons given for its expected limited success. Some thought is given to possible future A.I. programmes. Details of the semen imported and a financial balance sheet are given.

1. INTRODUCTION: During "Farmers Week" in July 1976 enquiries were made as to the possibility of importing frozen bovine semen for use in an Artificial Insemination (A.I.) programme. The availability of synthetic prostaglandins to Veterirary Surgeons made the proposals more realistic than would otherwise would have been the case.

Over the past few years, several farms have acquired A.I. equipment and semen for their own programmes. The practical knowledge of insemination technique has been acquired by attending, in England, the Milk Marketing Board's courses of instruction.

A.I. was first used in the Falklands by Mr. C. T. McCrea M.R.C.V.S. in 1969 and on this, as on subsequent occasions, the success was limited due to the difficulty of obtaining a regular supply of liquid nitrogen in relation to the number of cows coming into season at any one time.

2. ORGANISATION: In October 1976, a circular was sent to all farm managers to try to assess the interest in an A.I. programme and to reveal the interest in different cattle breeds. A very limited number of replies were received and most of these were vague both with regard to numbers of cows for insemination and breeds required. Further information was obtained from the farm managers by verbal questioning.

In May 1977, a report was submitted to the Falkland Islands Government and the Sheepowners' Association on the feasibility and logistics of an A.I. programme. Approximate costings were also submitted.

During "Farmers Week" in June 1977, the S.O.A. indicated that they were still keen and interested in the programme and gave verbal assurances of financial and logistical backing. It was agreed that a charge of £10 per cow inseminated would be acceptable.

Later F.I.G. suggested that the whole scheme be put up for expert opinion from the Ministry of Overseas Development but by that time the semen had been ordered following a check of the continued interest among farmers and of numbers and breeds required.

In September 1977, a further circular was sent to all the farms participating in the scheme informing them about the timescale of the A.I. procedure, the handling and choice of cows to be inseminated.

In January 1978, 370 straws of bovine semen arrived by sea.

3. OESTRUS SYNCHRONISATION: In order to reduce the number of visits to farms, and therefore reduce the time spent travelling and the number of Beaver flights required - and so be able to accommodate more farms in the limited time - it was decided to issue I.C.I. Estrumate to the farms to perform the two injections themselves. The Estrumate was issued in January 1978 along with instructions as to its use and safety precautions necessary. It was considered expedient to visit some farms to perform these injections because either this would enable other work to be performed at a time more suitable to the farm, or the farms were unsure of the pregnancy status of the cows to be inseminated, or the farm personnel were considered unpractised in injection techniques.

4. EQUIPMENT: Although there was, at the time of organising the A.I. programme, a variety of A.I. equipment already in the Islands, only one farm - Port San Carlos - was prepared to lend their three cylinders for the benefit of the scheme. Other farms either wanted to sell or hire their equipment.

Port San Carlos supplied, free of charge, one XR-16 storage cylinder, one liquid nitrogen storage flask and a small "30 day" cylinder.

Although some equipment was available from the Grasslands Trials Unit (e.g. thermometer, scissors, forceps, protective clothing), it was necessary to purchase the catheters, plastic sleeves etc. from the M.M.B. in U.K. Details are given in the balance sheet.

It was decided to obtain the semen from the M.M.B. Export Section and have it shipped out by sea freight and for this purpose the XR-16 and storage flask were sent to U.K. Sea transport was chosen rather than air freight because of the possibility of delay in trans-shipment at either of the two intermediate Airports in Argentina. The possibility, together with the fact that the cylinders would have been flown at about 30,000 feet in an unpressurised compartment, meant that the risk of loss by sea was less than by air.

On arrival in the Falklands, the semen was tested and was found viable. However, the liquid nitrogen levels in the two cylinders were low, so it was decided to Place the semen in the 30 day cylinder and to use the other two as nitrogen reserves. When the liquid nitrogen storage flask was emptied, it was sent to the Embassy in Buenos Aires for replenishment by La Oxigena. It had been hoped that rapid transport to B.A. and back to Stanley would be assisted by official sources but this proved impossible and the cylinder was absent for 3 weeks before coming back on H.M.S. Endurance. On arrival it was found to be about $\frac{2}{3}$ full. (The local L.A.D.E. office had previously indicated their unwillingness to carry the full cylinders but suggested that the Head Office be contacted for their views. No further action was taken).

The M.M.B. had been requested to ensure that all the straws, catheters, plastic sheaths and other equipment were of compatible size but it was discovered that some straws were $\frac{1}{2}$cc but the majority were $\frac{1}{4}$cc. Consequently an adaptation to some equipment was necessary and this was only partially successful. The M.M.B. sent their profuse apologies and undertook to supply the correct size pieces (free of charge). Unfortunately these arrived after the termination of the programme.

5. PROBLEMS ENCOUNTERED: in the A.I. programme included the logistical problem of the right personnel reaching the cows with all the equipment in time for the insemination, the farm organisation for animal handling and the problem of the wrong size straws.

The logistical problems were considerable and, when allowing for bad weather, aircraft maintenance, other aircraft duties, the only reason why there was but one farm which had to abandon the A.I. because the inseminator could not reach the cows in time, was due to the fact that as much travel as possible was done overland. A secondary benefit of this mode of transport, although rough and hazardous for the semen container was that the liquid nitrogen was not subjected to rapid changes in atmospheric pressure which influences the boiling rate.

On some farms the facilities for the handling and insemination of the cows were good, the primitive and rudimentary conditions under which cattle are often managed leads to considerable animal (and inseminator) stress which will result in reduced conception rates.

Many of the animals presented for insemination were in poor condition further reducing the chances of successful insemination. Although insemination of such animals was thought to be wasteful, the procedure was performed as there was a slight chance of success and the semen only had a limited, and unguaranteed life.

On one farm, the inseminator was assured that the cows could not possibly be in calf, but, nevertheless, one cow aborted a living calf after the first Estrumate injection and another was found to be pregnant when presented for insemination.

Due to the failure of two Beaver flights, it was found that the reserves of liquid nitrogen were exhausted and the semen subsequently died on 31st March. It had been planned that these two flights would enable a check to be made on the nitrogen levels and fresh supplies obtained if necessary. Consequently, the A.I. at Port Howard was totally abandoned and, although the cows at Fox Bay East and Dunnose Head were inseminated, the chances of success are minimal. Semen for Douglas Station was also lost but this was not part of the A.I. scheme based on oestrus synchronisation and the purchaser had failed to collect the semen in good time.

It had been hoped to pay Port San Carlos for the use of their cylinders, but this has proved impossible.

6. FUTURE POSSIBILITIES: The success or failure of this programme can not yet be assessed but a calving rate of 35-40% would be very acceptable - bearing in mind the points made above. However, the crossbred animals so produced are very much cheaper (although not pure) than the importation of live animals.

The success of the variety of breeds used in the scheme will only be assessed in years to come but the use of such breeds and the operation of the programme has helped, it is hoped, to stimulate interest in the operation and function of cattle breeding.

In future, more attention should be paid to discussion about choice of breeds with the farmers. This can only be done by verbal questioning as circulars and questionnaires do not receive replies.

If an artificial insemination programme is repeated, the following details should be considered - (1) the inseminator and the programme should be under Veterinary supervision; (2) the use of synthetic agents (e.g. prostaglandins) greatly facilitates the performance of such a programme; (3) cows and cow management should be carefully screened with an emphasis on insemination on those farms which have a definite breeding policy and recording scheme; (4) preferably farms should present 10 or more cows for insemination at one time (several farms could "share" the cows); (5) selection of the cows and bulls must be on health, suitability to the environment and production aims; (6) the problem of regular supplies of liquid nitrogen must be resolved.

7. DETAILS of the imported semen and a balance sheet are attached.

8. ACKNOWLEDGEMENT is due to Mr. A. Miller of Port San Carlos for the loan of cylinders and to Mr. E. W. M. Carden of the Milk Marketing Board for his help and advice.

R. S. WHITLEY B.V.M. & S., M.R.C.V.S.
14th April 1978

Summary of Progeny of Artificial Insemination Porgramme

1978

Farm	Breed	Males	Females	Twins	Total Calves	Cows Available
Darwin (Dairy herd)	Ayrshire (Pant Outlaw)	3	5	1 mixed	10	
	Burnockstone (Westside Charm)	3	5		8	30
(Beef herd)	one unidentified calf thought to be from AI					
Fitzroy	South Devon	2			2	6
Hill Cove	Lincoln Red		1		1	4
Roy Cove	Lincoln Red	1	1		2	6
Pebble Island						5
Port San Carlos	Ayrshire (Blue)	1				
	Lincoln Red	1	1			
	Simmental	1			4 (possibly others)	24
Port Stephens	Welsh Black	2	1		3	9
Johnson's Harbour	Ayrshire (Pant Outlaw)	1	1		2	2
Green Patch						4
Rincon Grande	Devon	1				
	South Devon	1	1		3	12

It should be noted that the records of the Darwin beef herd and the Port San Carlos herd are incomplete.

APPENDIX 1

SEMEN IMPORTED INTO THE FALKLAND ISLANDS, JANUARY 1978

BREED	NAME OF BULL	NUMBER OF STRAWS
AYSHIRE	BURNOCKSTONE WESTSIDE CHARM	50
AYRSHIRE	PANT OUTLAW	50
DEVON	BOVEY LONELY 1ST	40
LINCOLN RED	DONNINGTON TROOPER	40
LUING	LUING SWIFT	22*
LUING	LUING ROCKET	19*
SIMMENTAL	MMB PILOT	20
SOUTH DEVON	WINDSOR SLAM 2ND	40
SUSSEX	HINKLEY GLOW-WORM	40
WELSH BLACK	TRYFAL EBRILLWR	50
	TOTAL	371

(* Although 20 straws of each Luing Swift and Luing Rocket were ordered, those supplied are as shown).

DISSEMINATION OF STRAWS

134	cows were inseminated twice	=	268 straws
13	cows inseminated twice with straws suspected dead	=	26
4	straws used for testing purposes	=	4
3	straws accidentally damaged on farms	=	3
70	straws lost when liquid nitrogen evaporated	=	70
			371

55

APPENDIX 11

RECEIPTS

(i) based on charge of £10 per cow inseminated.

	£
ROY COVE	60
DARWIN	600
TEAL INLET	30
FITZROY	60
PORT STEPHENS	80
PORT STEPHENS	10
HILL COVE	40
PORT SAN CARLOS	250
RINCON GRANDE	140
FOX BAY EAST	130
GREEN PATCH	40
PEBBLE ISLAND	60
JOHNSONS HARBOUR	20
TOTAL	£1,520

(ii) based on a charge of £10 per cow inseminated plus additional use of Estrumate

PORT HOWARD	136.80

(iii) based on cost price plus a handling charge

DOUGLAS STATION	93.00

TOTAL RECEIPTS £1,749.80

PAYMENTS

(i) MILK MARKETING BOARD

370	DOSES OF SEMEN	890.00
25	LITRES LIQUID NITROGEN	6.25
4	INSEMINATION CATHETERS	18.00
480	INSEMINATION SHEATHS	12.00
2	STORAGE CONTAINERS	
	COLLECTION & DELIVERY etc.	121.82
	TOTAL	£1,053.07

(ii) VETERINARY DRUG COMPANY, YORK

ESTRUMATE	385.40

(iii) L.A.D.E.

AIR FREIGHT	4.24

TOTAL P/MENTS £1,442.71

REPAYMENTS

PORT HOWARD	136.80
TEAL INLET	30.00
FOX BAY EAST	130.00

TOTAL RE/P/MENTS 296.80

TOTAL RECEIPTS	£1,749.80	TOTAL PAYMENTS	£1,442.71
		TOTAL REPAYMENTS	296.80
	£1,749.80		£1,739.51

BALANCE £10.29

56

APPENDIX 11

RECEIPTS

(i) based on charge of £10 per cow inseminated.

	£
BOY COVE	60
DARWIN	600
TEAL INLET	30
WITZROY	60
PORT STEPHENS	80
PORT STEPHENS	10
HILL COVE	40
PORT SAN CARLOS	250
RINCON GRANDE	140
FOX BAY EAST	130
GREEN PATCH	40
PEBBLE ISLAND	60
JOHNSONS HARBOUR	20
TOTAL	£1,520

(ii) based on a charge of £10 per cow inseminated plus additional use of Estrumate

PORT HOWARD	136.80

(iii) based on cost price plus a handling charge

DOUGLAS STATION	93.00

TOTAL RECEIPTS £1,749.80

PAYMENTS

(i) MILK MARKETING BOARD

375 DOSES OF SEMEN	890.00
25 LITRES LIQUID NITROGEN	6.25
1 INSEMINATION CATHETERS	15.00
180 INSEMINATION SHEATHS	12.00
2 STORAGE CONTAINERS	
COLLECTION & DELIVERY	
etc.	121.82
TOTAL	£1,053.07

(ii) VETERINARY DRUG COMPANY, YORK

ESTRUMATE	385.40

(iii) L....D.E.

AIR FREIGHT	4.24

TOTAL P/MENTS £1,442.71

REPAYMENTS

PORT HOWARD	136.80
TEAL INLET	30.00
FOX BAY EAST	130.00

TOTAL RE/P/MENTS 296.80

TOTAL RECEIPTS	£1,749.80	TOTAL PAYMENTS	£1,442.71
		TOTAL REPAYMENTS	296.80
	£1,749.80		£1,739.51

BALANCE £10.29